EPA/ROD/R02-88/500
1988

EPA Superfund
Record of Decision:

LOVE CANAL
EPA ID: NYD000606947
OU 06
NIAGARA FALLS, NY
09/26/1988

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R02-88/063
September 1988

PB89-214399

Superfund
Record of Decision:

Love Canal/93rd Street, NY

9/26/88

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12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. Type of Report & Period Covered 800/000
	14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Love Canal/93rd Street School site consists of approximately 19 acres and includes a school and an adjacent vacant lot. The site is located in Niagara Falls, New York, less than one mile northwest of Love Canal and is within the Love Canal Emergency Declaration Area. It is bordered by Bergholtz Creek to the north and residential properties to the east, west and south. A small area east of the school and adjacent to Bergholtz Creek is within a 100-year flood plain. Hooker Chemicals and Plastics Corporation disposed of over 21,000 tons of various chemicals at the Love Canal site from 1942 to 1953, when the site was deeded over to the City of Niagara Falls Board of Education. Sampling has revealed that approximately 6,000 yd^3 of soil are contaminated. During the 1950s, home construction accelerated in the area. Specifically, in 1950, the 93rd Street School was built, and in 1954, the 99th Street School was built adjacent to the middle portion of the Canal. Prior to construction of the 93rd Street School, a drainage swale crossed the site. Between 1938 and 1951, the swale was partially filled with soil and rock debris, followed by sand and fly ash materials. In 1954, the site was graded to its present contours with approximately 3,000 yd^3 of fill material, including fill from the 99th Street School. The fill material is reported to contain fly ash and BHC (pesticide) waste. In 1980, the 93rd (See Attached Sheet)

17. Document Analysis a. Descriptors

Record of Decision
Love Canal/93rd Street School, NY
Third Remedial Action
Contaminated Media: soil
Key Contaminants: metals (arsenic, lead), organics (dioxin, PAHs, pesticides), VOCs (toluene, xylenes)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 175
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

16. ABSTRACT (continued)

Street school was closed due to public health concerns related to the potentially contaminated fill material. The primary contaminants of concern affecting soil are VOCs, including toluene and xylenes, other organics including dioxins, PAHs and pesticides, and metals including arsenic and lead.

The selected remedial action for this site includes: excavation and solidification/stabilization of 7,500 yd^3 of soil; placement of solidified soil back in excavated location; installation of a RCRA cap; ground water monitoring; and implementation of treatability studies for solidification process. The estimated capital cost for this remedial action is $2,295,000 to $3,675,000 with estimated annual O&M of $121,000.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Love Canal - 93rd Street School site, City of Niagara Falls, Niagara County, New York

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Love Canal - 93rd Street School site, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601, et. seq., as amended by the Superfund Amendments and Reauthorization Act of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, (NCP) 40 C.F.R. Part 300 (November 20, 1985).

This decision is based upon the Administrative Record for the Love Canal - 93rd Street school site. The attached index identifies the items which comprise the Administrative Record upon which the selection of the remedial action is based.

The State of New York concurs with the selected remedy (see attached).

DESCRIPTION OF THE REMEDY

This remedy addresses the source of contamination by remediation of the on-site contaminated soil. The remedy addresses the principal threats at the site by permanently immobilizing the contaminated soil at the Love Canal - 93rd Street School site, thereby preventing any potential groundwater contamination and reducing the risks associated with exposure to the contaminated soil.

The major components of the selected source control remedy include:

- Excavation of approximately 7,500 cubic yards of contaminated soil followed by on-site solidification/stabilization of this material;

- Placement of the solidified soil on-site within the same unit of contamination from which it originated, with a low permeability cover (consistent with the Resource, Conservation and Recovery Act (RCRA) 40 CFR § 264.310 landfill closure requirements) installed over these areas and extended to other areas which exhibit lower levels of contaminated soil at the site;

- Additiona1 sampling and analysis (with the lowest achievable levels of detection) of the groundwater to determine whether applicable or relevant and appropriate federal and state requirements (ARARs) and other criteria to be considered for groundwater are being met. This sampling was conducted in May 1988 and the analytical results are anticipated to be available in the fall of 1988;

- Monitoring of the groundwater in accordance with RCRA regulations, 40 CFR Part 264 Subpart F; and

- Treatability studies during the remedial design to determine the effectiveness of the solidification process for the particular soil and its ability to meet specified treatment levels. Should the treatability studies determine that solidification would not provide the desired degree of treatment (e.g., Land Disposal Restriction treatment standards), then treatability studies would be performed to determine the effectiveness of other treatment techniques (including thermal treatment) for the on-site soil.

DECLARATION

The selected remedy is protective of human health and the environment because all threats associated with soils ingestion, inhalation and dermal contact would be eliminated. The remedy will attain federal and state requirements that are applicable or relevant and appropriate to the remedial action (e.g., by treating the soils to a level which satisfies the requirements for land disposal and complying with Subtitle C landfill closure requirements), and is cost-effective. This remedy will satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element by selecting solidification which is expected to permanently immobilize the contaminated soil and eliminate any potential for leaching of both organic and inorganic contaminants. The remedy will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

Because this remedy will result in hazardous substances remaining on-site, a review will be conducted within five years after commencement of the remedial action and at least every five years, thereafter, to ensure that the remedy continues to provide adequate protection of human health and the environment.

Sept. 26, 1988
Date

William J. Muszynski
William J. Muszynski, P.E.
Acting Regional Administrator

ROD DECISION SUMMARY

LOVE CANAL - 93rd STREET SCHOOL SITE

Niagara Falls, New York

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Region II
New York

TABLE OF CONTENTS

FIGURES

TABLES

ROD DECISION SUMMARY
Love Canal - 93rd Street School Site
Niagara Falls, New York

SITE LOCATION AND DESCRIPTION

The Love Canal - 93rd Street School site is situated in Niagara Falls, New York, less than one mile northwest of Love Canal, and is located in the Love Canal Emergency Declaration Area (EDA) (see Figure 1). It is bounded by Bergholtz Creek to the north, 93rd Street to the west, residential properties and 96th Street to the east, and Niagara Falls Housing Authority property and Colvin Boulevard the south. The total site area covers approximately 19 acres and includes both the 93rd Street School and the adjacent vacant land owned by the Housing Authority.

Although the site is relatively flat, it does slope gently from the east and west to the drainage swale located in the central portion of the site (see Figure 2). This swale slopes from the southeast to the northwest and discharges into a small gully, which in turn discharges to Bergholtz Creek and then to the Cayuga Creek, which is a tributary of the Little Niagara River. A small area east of the school adjacent to Bergholtz Creek is within the 100 year floodplain.

Overburden overlying bedrock at the site varies in thickness from 25 to 27 feet, and consists of glacial till covered by layers of clay, silt and fine sand. In the immediate vicinity of the school, layers of fill (up to 7.5 feet in thickness) and a thin layer of topsoil (typically less than 1 foot thick) have been deposited on top of the native overburden.

Groundwater flow at the site has a very low velocity. Groundwater contours for the site indicate the presence of a groundwater mound across the middle of the site in an east-west direction. The direction of groundwater flow out of this mound appears to be south-southwest from the southern end of the property and to the north-northeast from the northern end of the property.

Runoff and evaporation of precipitation far exceed percolation at the site due to the relatively low permeability of site soils. As a result, any potential transport of contaminants from the organic fill material to off-site areas would occur almost exclusively through erosion caused by surficial runoff rather than through percolation and movement with the groundwater. In addition, there are no known drinking water wells in the vicinity of the site and area residents receive their water from public water supplies.

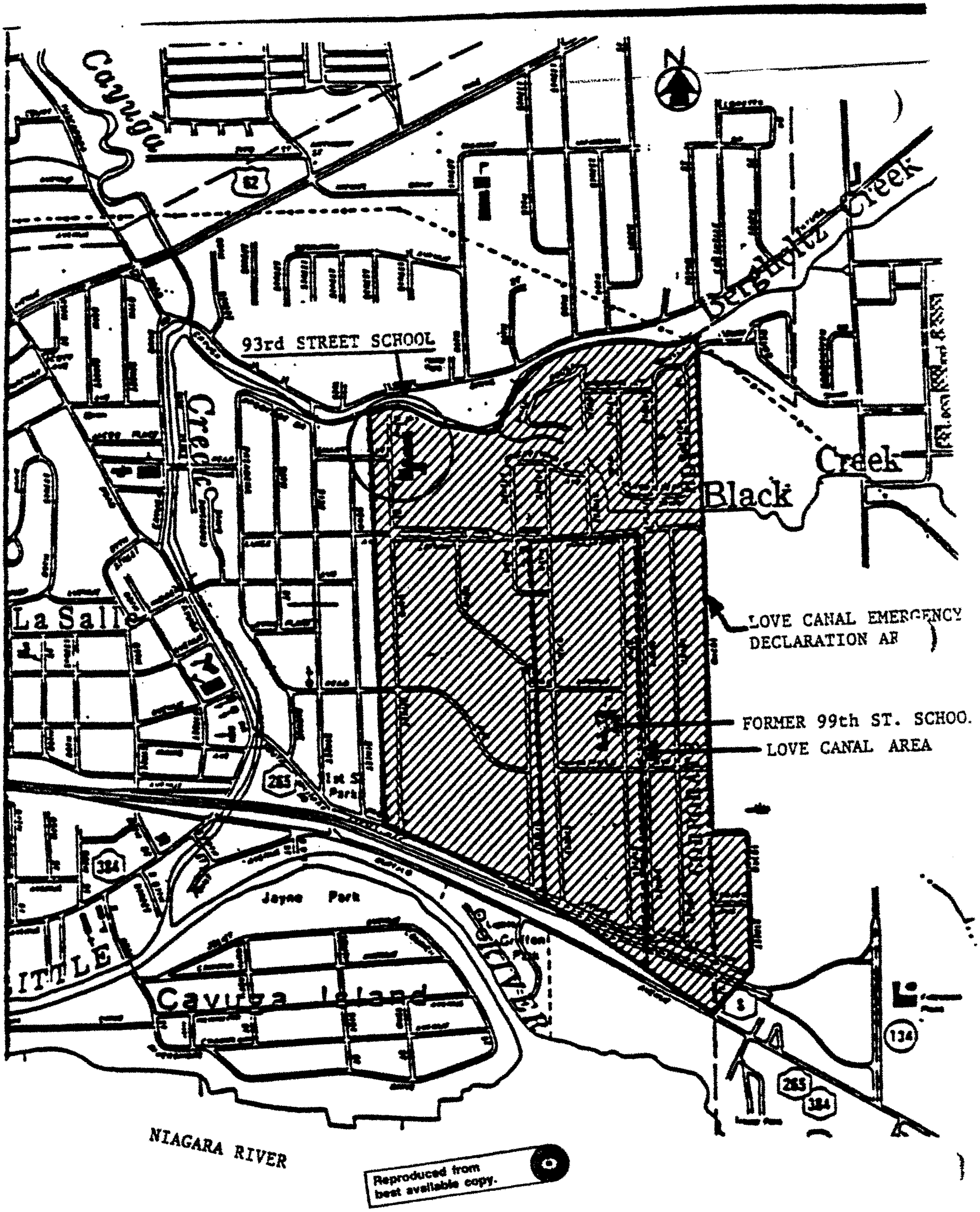
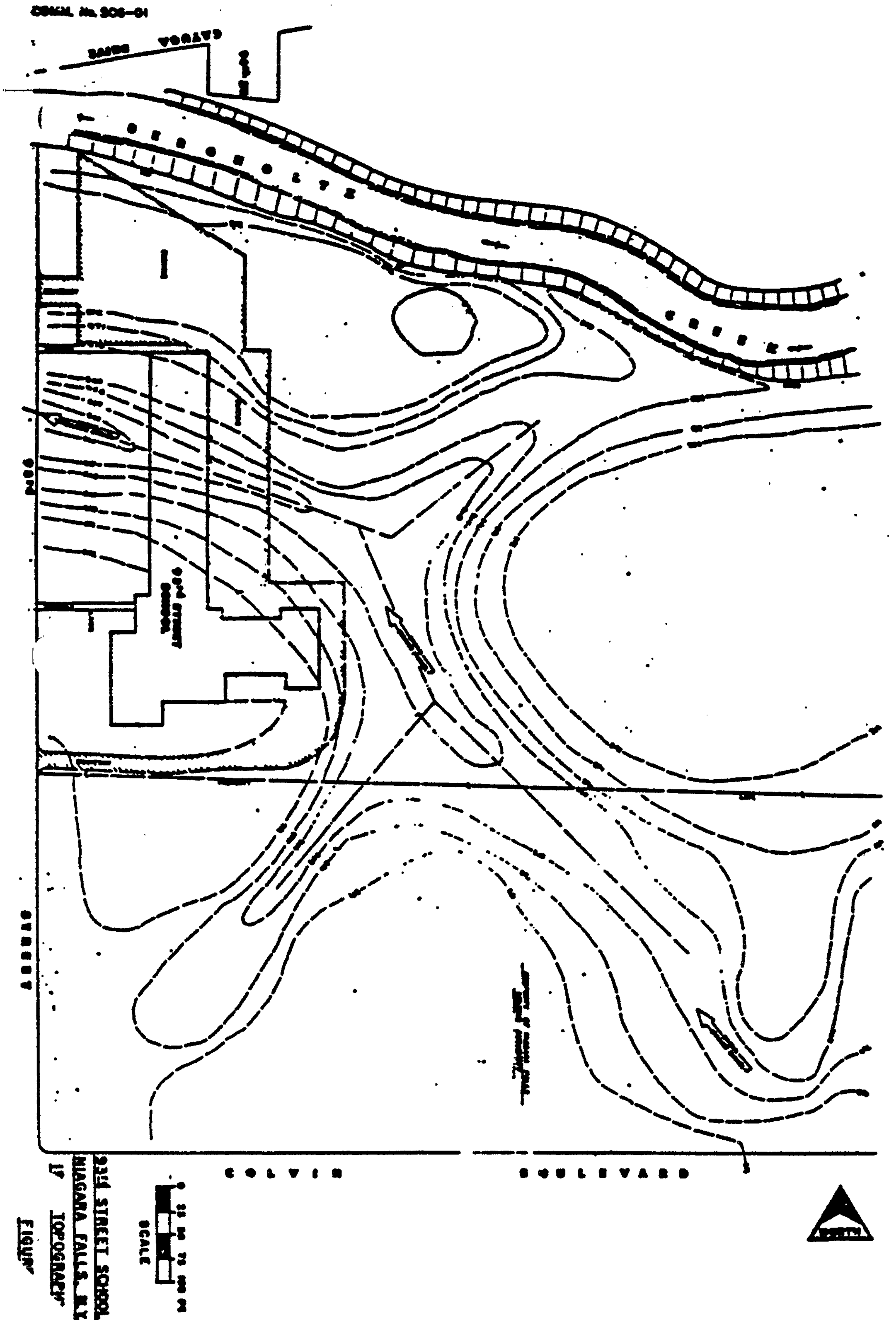


FIGURE 1

SITE LOCATION MAP

93rd STREET SCHOOL, NIAGARA FALLS, N.Y.


BERGHOLTZ CREEK
COLVIN BOULEVARD
93rd STREET SCHOOL
NIAGARA FALLS, N.Y.
TOPOGRAPHY
FIGURE
SCALE
NORTH

<u>SITE HISTORY</u>

The Love Canal hazardous waste site is located in the southeast corner of the City of Niagara Falls, and is approximately one-quarter mile north of the Niagara River. Hooker Chemicals & Plastics Corporation (now Occidental Chemical Corporation) disposed of over 21,000 tons of various chemicals (including dioxin-tainted trichlorophenols) at the Love Canal site between 1942 and 1953.

The Love Canal property was deeded by Hooker in April 1953 to the City of Niagara Falls Board of Education. During the 1950s, home construction accelerated in the area, and in 1950 the 93rd Street School was built less than one mile northwest of Love Canal, and in 1954 the 99th Street School was built adjacent to the middle portion of the Canal. Over the course of the next two decades, contaminated leachate migrated to the surface of the Canal and to nearby residential basements. The homes have since been demolished. Contaminants also migrated through area sewers to nearby Black and Bergholtz Creeks.

The 93rd Street School is an elementary school that was designed in 1947 and was constructed in 1950. Prior to the construction of the school, a drainage swale crossed the site from the southeast to northwest. This swale intersected 93rd Street and east-lying properties and discharged into Bergholtz Creek. Figure 2 depicts preconstruction contours (i.e., elevations of the land (in feet) above mean sea level) based on the 1947 site development drawing. Between 1938 and 1951, the swale was partially filled with soil and rock debris followed by sand and silt-sized carbon waste (fly ash) materials.

The site was graded in 1954 to its existing contours with approximately 3,000 cubic yards of fill material, among other fill, from the 99th Street School, which was located in the EDA on the Love Canal. Low areas east of the 93rd Street School including the playground (which had previously been filled with carbon waste) and the swale just south of the playground were filled with 99th Street School fill material and then covered with approximately one to three feet of topsoil.

The fill material at the 93rd Street School is reported to contain fly ash and BHC (pesticide) cake. The horizontal extent of the fill materials and the thickness and depths of respective layers at the 93rd Street School site were not accurately recorded during filling operations. In 1980, the 93rd Street School was closed due to public health concerns regarding the presence of the potentially contaminated fill materials.

A number of sampling investigations have been performed by both the New York State Department of Environmental Conservation

(NYSDEC) and the U.S. Environmental Protection Agency (USEPA) since 1979 because of the concern associated with the fill materials brought from Love Canal. These studies have shown that there are contaminants present on-site which include volatile and base/neutral/acid extractable organics, lindane, metals and dioxin. Two of these investigations indicated the presence of dioxin in two locations at the site above the Centers for Disease Control's level of concern of greater than 1 part per billion (ppb) for dioxin in residential soils (1.2 ppb - USEPA Field Investigation Team (NUS Corporation) - 9/85 and 2.3. ppb - RECRA Research Phase II Investigation - 8/84 *).

Through a Cooperative Agreement with the USEPA, the NYSDEC completed a remedial investigation/feasibility study (RI/FS), dated March 1988, for the 93rd Street School site through its contractor, Loureiro Engineering Associates (LEA).

ENFORCEMENT ACTIVITIES

This Record of Decision (ROD) addresses the remediation of the 93rd Street School site. The 93rd Street School is located within the northwest portion of the EDA of the Love Canal National Priority List site. A brief chronology of the Love Canal enforcement activities is presented below.

On December 20, 1979, the U.S. Department of Justice, on behalf of EPA, filed a federal law suit against Hooker Chemicals & Plastics corporation (now Occidental Chemical Corporation) pursuant to numerous environmental statutes, alleging an imminent and substantial endangerment to human health and the environment. New York State filed a lawsuit in state court in April 1980, against Occidental for damages sustained at Love Canal. This action was stayed on August 8, 1980. On June 8, 1980, New York State was joined as a defendant in the federal action. On September 11, 1980, New York State was realigned as a plaintiff in the federal case, and on September 8, 1980, the State filed its claims in federal court.

On April 16, 1982, EPA sent Occidental a CERCLA notice letter. On July 26, 1982, EPA and the State met with Occidental to explain the remediation activities which would be taken under Superfund. Occidental at that time refused to assume responsibility for remedial action at Love Canal. On December 9, 1983, the United States filed its second amended complaint against Occidental to include claims under Sections 106 and 107 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Occidental has filed counterclaims against the United States and the State and cross-claims against the City of Niagara Falls, the Niagara Falls Board of Education, and Niagara County.

RECRA Research, Inc. completed the Phase II Investigation under contract with the State of New York. The study was intended to finalize a Hazardous Ranking Score for the site.

On February 23, 1988, the U.S. District Court ruled on the governments' summary judgement motion holding that Occidental is liable under CERCLA for releases of hazardous substances from the Love Canal site. However, the extent of Occidental's liability under CERCLA is still subject to litigation.

On March 3, 1988, officials from Occidental formally presented to USEPA an alternative plan to remediate the sewers and creeks at Love Canal. USEPA and the NYSDEC rejected Occidental's alternative because of the lateness of the submission and the potential delay to the selected remedy. However, the governments also responded that they may at a later date reconsider the alternative if sufficient progress on implementation has been made.

In April 1988, the USEPA provided Occidental with the draft RI/FS for the 93rd Street School site, and notified Occidental of the proposed remedial action for the site as well as the close of the public comment period. The USEPA intends to send notice letters to the Potentially Responsible Parties (PRPs) upon approval of the ROD.

COMMUNITY RELATIONS HISTORY

The governmental effort to ensure significant community involvement at Love Canal has been extensive. A comprehensive community involvement strategy has been developed by NYSDEC to keep concerned parties cognizant of CERCLA activities at the site. NYSDEC maintains a Love Canal public information office at which Love Canal documents are made avialable for public review as they are produced. The office is located in the EDA at 9820 Colvin Boulevard. In addition to this office, the USEPA has a public information office in the City of Niagara Falls. The public is also kept informed through frequent public meetings.

The draft RI/FS identifying six remedial options, and the proposed remedial action plan (PRAP) was released for public comment on April 5, 1988. On the same date, USEPA and NYSDEC published a public notice which appeared in the Niagara Gazette, the Buffalo Sunrise and the Buffalo Evening News, announcing the availability of the RI/FS and the PRAP and that a public meeting would be hold in Niagara Falls on April 13, 1988. In addition, an article announcing the April 13, 1988 public meeting and an availability session was published by the Niagara Gazette. NYSDEC also announced the availability of the RI/FS and the PRAP through a special addition of the Love Canal Landfill Update which is available at the NYSDEC Love Canal Public Information Office. The public repositories for the Administrative Record, which includes the RI/FS, are the NYSDEC Public Information Office in Niagara Falls and the USEPA Region II Office in New York City.

USEPA and NYSDEC hold a public meeting and an availability session on April 13, 1988 and April 14, 1988 respectively, to present the findings of the RI/FS and the PRAP. The attached July 1988 Responsiveness Summary addresses questions and concerns raised by the public during the public comment period, which closed May 25, 1988. A transcript of the public meeting was prepared in accordance with Section 117(a)(2) of CERCLA, and is available to the public at the above-mentioned Administrative Record repositories.

SCOPE OF RESPONSE ACTION

This response action addresses the principal threat at the Love Canal - 93rd Street School site which involves eliminating the potential for direct contact with site wastes; eliminating the potential for the transport of contaminated volatiles and fugitive particles into the air; and eliminating the transport of contaminated particles in surface water runoff.

Additional sampling of the groundwater at the 93rd Street School site was conducted in May 1988 with the results expected to be available in the fall of 1988. The additional sampling was performed to ensure that the groundwater is not being impacted. Should the additional sampling results indicate that groundwater standards and other criteria to be considered are exceeded, then an evaluation of the necessity for remediation of the groundwater would be conducted. Remediation of the groundwater, if warranted, would be addressed in a subsequent ROD. A further discussion of the necessity for the additional sampling is presented in the next section.

This response action focuses solely on the remediation of the 93rd Street School site. A number of other projects related to the remediation of the Love Canal site are underway. These projects include Black and Bergholtz Creek remediation (this includes the development of design documents for the procurement of a thermal destruction unit to destroy sediments from Black and Bergholtz Creek remediation and other materials stored on-site), operation of the Love Canal Treatment Plant, 102nd Street Outfall Delta Area, and EDA home maintenance and buyout.

SITE CHARACTERISTICS

The RI/FS, prepared by NYSDEC's contractor, LEA (March 1988), concluded that soils at the site are contaminated with inorganics, volatile organics, base/neutral/acid extractable organics and alpha and beta BHC which exceed health and environmentally-based values.

Tables 1 and 2 list all inorganic and organic compounds, respectively, detected in soils during the RI, along with the concentration and station where the highest level was detected, and background concentrations in soils from around New York State. Criteria (e.g., cleanup levels for dioxin and background levels for other compounds) are considered in evaluating the extent of contamination at this site. All compounds that were found to exceed background are noted on Tables 1 and 2. For example,

Table 1

INORGANIC SOIL COMPOUNDS AND RESPECTIVE BACKGROUND CONCENTRATIONS CONSIDERED

			NY SOIL BKGRND††††	
Parameter	Highest Conc mg/kg† (ppm)	Sta	Mean mg/kg (ppm)	No.Samples Exceeding Background
Aluminum	10700	1P13A	48,000	0
• Antimony	209n	1P4B	0.75(<9)	59(59)
• Arsenic	350	1P4D	7.0(10.6)	21(15)
Barium	565n	1P4C	300	4
Beryllium	3.4n	1P4A	0.6	20
• Cadmium	133n	1P4B	0.4†††(4)	68(27)
Calcium	202000	1P4A	5,200	42
Chromium	516	1P1B	34	15
• Cobalt	52	1P3E	8	21
Copper	44	1P11E	22	28
Iron	86600	1P15D	28,000	17
• Lead	843	2P114A	21(114)	42(5)
Magnesium	42000*	1P13B	5,000	28
Manganese	3000n*	1P3E	1,100	5
• Mercury	23	1P1B	0.15(0.15)	26(26)
Nickel	47	1P8F	14	66
Potassium	3550*	1P5B	15,500	0
Selenium	4.1s	1P1C	0.3	3
Silver	3.2	1P9D	No data	-
Thallium	1.2	1P8F	9.08	0
Vanadium	59	1P15C	60	0
Zinc	18200*	1P4B	64	54
Molybdenum	229	1P4A	No data	-
Titanium	825	1P3C	No data	-

† Subscript definitions for this column are as follows:
n = indicates spike sample recovery is not within control limits
* = indicates duplicate analysis is not within control limits
s = indicates value determined by Method of Standard Addition

††† Average from Cadmium in the Environment, J. O. Nriagu, ed, pg. 588.

††††From "Summary of Inorganic Constituent Concentrations in Soil Samples from Around the State of New York (Boerngen and Shacklette, 1981) with the exception of values in parentheses which are from Michael E. Hopkins of the Niagara County Health Dept., and were believed to be average background concentrations for soils in the Niagara Falls area.

• These parameters exceed guidance/criteria considered. (See Site Characteristics Section in Text)

Table 2

ORGANIC SOIL COMPOUNDS

Parameter	Highest Conc ug/kg* (ppb)	Sta
VOLATILE ORGANICS		
• Methylene chloride	7700	1P9F
Acetone	4500	1P5B
• 1,1 Dichloroethene	1400B*	2P135
• Chloroform	1500	2P135
2-Butanone	5300	1P9B
• 1,1,2,2-Tetrachloroethane	2400	2P135
• Toluene	13000B	1P10C
• Ethylbenzene	1600	1P9E
• Xylenes	2000	1P10C
R/N/A		
1,4-Dichlorobenzene	830	1P4F
Naphthalene	1500D	1P4C
2-Methylnaphthalene	910D	1P4C
Acenaphthene	11000D	1P4C
Dibenzofuran	62000	1P4E
POLYNUCLEAR AROMATIC HYDROCARBONS (PAHs)		
• Fluorene	14000D	1P4C
• Phenanthrene	82000D	1P4C
• Anthracene	22000D	1P4C
• Fluoranthene	45000D	1P4C
• Pyrene	56000D	1P4C
• Benzo (a) anthracene	26000D	1P4C
Bis (2-Ethylhexyl) Phthalate	630	1P3A
• Chrysene	24000D	1P4C
• Benzo (b) fluoranthene	31000D	1P4C
• Benzo (k) fluoranthene	4900D	1P4C
• Benzo (a) pyrene	19000D	1P4C
• Indeno (1,2,3-cd) pyrene	8200D	1P4C
Benzo (g,h,i) perylene	2100	1P9B
PESTICIDES/PCBs		
• Alpha BHC	13	1P8E
• Beta BHC	137	1P4C

* Subscript definitions for this column are as follows:

B = indicates analyte was found in blank as well as sample.

D = indicates sample extract was diluted due to sample matrix and/or concentration levels.

• **These parameters exceed guidance/criteria considered.**
(See Site Characteristics Section in Text)

arsenic was detected in both the surface and subsurface soils up to 350 ppm, while the average background concentration for arsenic in soils around New York State is 7 ppm. In addition, background levels from the Niagara Falls Control Areas in the EPA study, "Environmental Monitoring at Love Canal" showed no detectable concentrations of those PAHs which were detected at the 93rd Street School site.

Dioxin contamination was not detected in any of the 29 composite soil samples collected and analyzed during the RI. However, as described previously, NUS Corporation detected dioxin in three surface soil samples at concentrations of 1.2 ppb, 0.11 ppb and 0.19 ppb (September 1985). In addition to the NUS Corporation findings, RECRA Research, Inc. also detected dioxin on-site during the Phase II Investigation (August 1984) at a concentration of 2.3 ppb at a depth of 4 to 6 feet below the surface.

Based upon a level-of-concern for dioxin for this site of greater than 1 ppb *, the total volume of dioxin-contaminated soil at the site exceeding this 1 ppb level is estimated to be 550 cubic yards.

The extent of soil contamination which could impose a significant risk to nearby populations was determined during the RI. While contamination was typically greatest in the thickest fill layers located in the deepest portions of the historic swale, there was some contamination present in the thinner fill layers also. Therefore, a preliminary estimate of the volume of soil/fill potentially requiring remediation was developed based on the determination that the entire volume of fill should be addressed. Additional study during the preparation of the risk assessment, however, indicated that in a hot-spot area directly to the east of the school, the levels of carcinogenic contaminants of concern (i.e., arsenic, dioxin and PAHs) were significantly greater than for the rest of the site. Figure 3 on the following page shows the extent of these hot-spot soils.

The total volume of hot-spot soils was computed by the average end area method by comparing present day surficial contours with depths at least 1 foot below depths at which contaminants posing an unacceptable risk were identified in the risk assessment. The final volume of soil obtained by this method was approximately 6,000 cubic yards (including dioxin hot-spots). It should be noted that if this volume of

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* The Centers for Disease Control has recommended greater than 1 ppb as the level of concern for dioxin in soils in residential areas for the Times Beach, Missouri site. Since the 93rd Street School is located in a residential area, the level of concern for dioxin greater than 1 ppb is also recommended for this site.

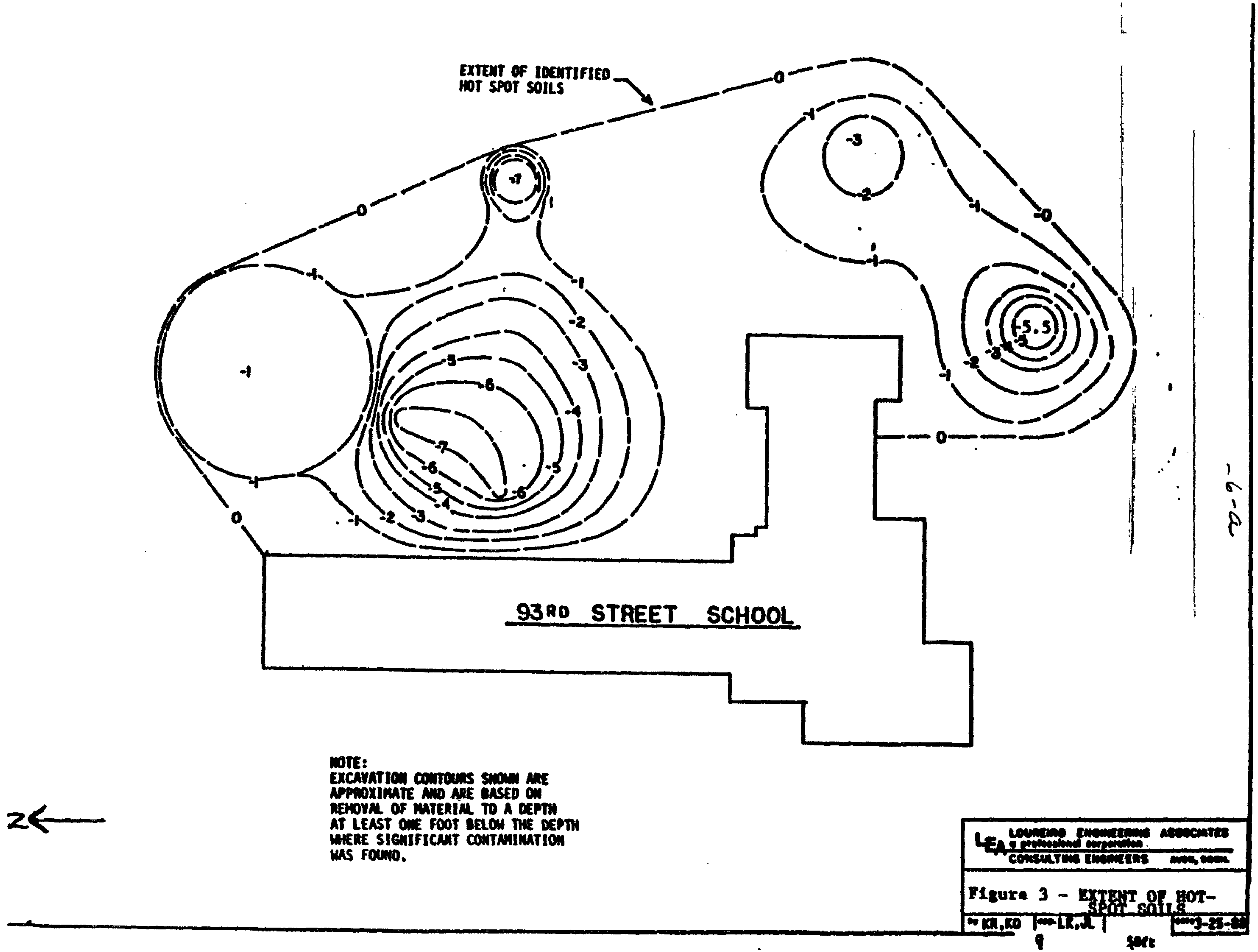

Figure 3 - EXTENT OF HOT-SPOT SOILS

soil were to be excavated, an additional 25 percent of material might be removed using conventional construction equipment during excavation. Therefore, for all excavation alternatives evaluated in this summary, a volume of 7,500 cubic yards will be considered.

Although the area is served by a municipal water supply and the groundwater at the site is not currently used, nor is it planned to be used as a drinking water source, samples were taken and analyzed. Those analyses indicate that a non-health-based New York State secondary groundwater standard for aesthetics (taste and odor) for iron was exceeded at the site, and that the groundwater and surface water at the site are not otherwise contaminated at levels exceeding the Contract Required Detection Limits (CRDLs). Those analyses also indicate that, for certain compounds, the groundwater and surface water did not exceed promulgated health-based applicable or relevant and appropriate federal and state requirements (ARARs). For other compounds, however, the CRDLs used during the RI exceeded both New York State and USEPA drinking water standards. In addition, some compounds detected exceeded guidance values and criteria considered. Consequently, additional sampling of the groundwater was conducted in May 1988. The analysis of these samples (with the lowest achievable levels of detection) will determine whether groundwater ARARs and other criteria to be considered are being exceeded. The results are anticipated to be available in the fall of 1988.

Tables 3 and 4 list all compounds detected at or above CRDLs in groundwater monitoring wells and surface water, respectively, along with the concentration and station where the highest level was detected, and the respective ARARs and/or other criteria/guidance to be considered. As indicated in Table 3, antimony, magnesium, manganese, nickel and sodium are present in groundwater at the site exceeding criteria considered. However, these criteria are either based on aesthetics or advisories. Since the groundwater is not being used as a drinking water source, nor is it planned to be, it has been determined that these criteria are not considered appropriate for this site. The compounds for which CRDLs exceeded their ARARs and other criteria considered for groundwater are listed in Table 5.

As discussed previously, ponding of the groundwater is evident at the site. This is due to the low permeability of the clay layer underlying the fill material and the relatively impermeable clay barrier present at the western (downgradient) end of the former drainage swale. Therefore, off-site contaminant transport from the fill area would probably occur due to erosion caused by surficial runoff of precipitation, rather than by percolation and movement in the groundwater.

A review of air quality data collected during the RI to ensure worker health and safety indicates that no significant levels of volatile contaminants above background were dectected in the breathing zone of the workers throughout drilling and well

Table 3

GROUNDWATER MONITORING WELL COMPOUNDS AND RESPECTIVE ARARS AND/OR OTHER CRITERIA/GUIDANCE TO BE CONSIDERED

(all values in ug/l = ppb)

Parameter	Highest Conc ug/l	Sta	NYSDEC WQ REGS GA Std	NYSDEC WQ REGS GA Guidance	NYSDOH Source Std	Federal MCLs and Other Criteria/ Guidance
INORGANICS						
Aluminum	1020	SMW1	None	None	None	None
Antimony	219	SMW1	None	3	None	None
Cadmium	8.5	SMW1	10	NA	10	10(5)
Calcium	3001000	SMW9	None	None	None	None
Copper	52	SMW7	1000	NA	200	(1300)
Iron	19400E	SMW2	300	NA	None	300 ++
Magnesium	401000	SMW1	None	35000	None	None
Manganese	3930E	SMW2	300	NA	None	50 ++
Mercury	0.92	SMW9	2	NA	5	2
Nickel	553	SMW6	None	None	None	150 H
Potassium	6600	SMW1	None	None	None	None
Sodium	228000	SMW1	None	None	None	20,000 R
Zinc	64	7140	5000	NA	300	5,000 ++
Molybdenum	1590	SMW1	None	None	None	None
VOLATILE ORGANICS						
Methylene Chloride	24B*D	7140	None	50	None	None
Acetone	1100D	7140	None	None	None	None
B/N/A						
Bis(2-ethylhexyl) phthalate	100	7150	4200	NA	None	None
Di-n-octyl phthalate	35	7150	None	50	None	None
PESTICIDES/PCBs/DIOXIN						
	None					

Subscript definitions are as follows:

E = indicates a value estimated due to the presence of interference
B = indicates analyte was found in blanks as well as the sample
*** = indicates duplicate analysis is not within control limits**
D = indicates sample extract diluted due to sample matrix and/or concentration level

++ = secondary maximum contaminant level (Aesthetic guideline)
( )= proposed maximum contaminant level
H = lifetime health advisory
R = the concentration in drinking water at which ingestion will be incompatible with a sodium restricted diet

Table 4

SURFACE WATER COMPOUNDS AND RESPECTIVE ARARS AND/OR OTHER CRITERIA/GUIDANCE TO BE CONSIDERED
(all values in ug/l = ppb)

	Highest Conc		NYSDEC WQ REGS		NYSDOH
Parameter	ug/l†	Sta	A Std	A Guidance	Source Std
INORGANICS					
Aluminum	259	SW1	None	None	None
Antimony	90	SW2	None	3	None
Calcium	52300	SW2	None	None	None
Chromium	46	SW1	50	NA	50
Iron	378E	SW1	300	NA	None
Lead	12	SW1	50	NA	50
Magnesium	25200	SW2	35000	NA	None
Manganese	209E	SW2	300	NA	None
Nickel	55	SW1	None	None	None
Silver	44N	SW1	50	NA	50
Sodium	7400	SW2	None	None	20,000
Zinc	72	SW1	300	NA	300
VOLATILE ORGANICS					
	None				
B/N/A					
D_i-N-Octyl phthalate	21	SW1	None	50	None
PESTICIDES/PCBs/DIOXIN					
	None				

†Subscript definitions for this column are as follows:
E = indicates a value estimated due to the presence of interference
N = indicates spike sample recovery is not within control limits

Table 5

COMPOUNDS FOR WHICH CRDLS(1) EXCEED ARARS AND OTHER GUIDANCE/CRITERIA CONSIDERED FOR GROUNDWATER

Parameter	CRDL(ppb)	ARAR(2)
Vinyl chloride	10	2 (Federal MCL)
1,1,2,2-Tetrachloroethane	5	0.2 (State Guidance)
Benzene	5	ND(4.4)
1,2-Dichloroethane	5	0.8
1,1-Dichloroethene	5	0.07 (State Guidance)
Tetrachloroethene	5	0.7 " "
Phenols, Total	10	1.0
Aniline	10	1.0 (State Guidance)
Bis(2-Chloroethyl)Ether	10	1.0
Dichlorobenzenes (3)	10	4.7
2,4-Dichlorophenol	10	0.3
Hexachlorobutadiene	10	0.5
Hexachloropentadiene	10	1.0
2,6-Dinitrotoluene	10	0.07 (State Guidance)
Hexachlorobenzene	10	0.35
Pentachlorophenol	50	21.
Benzidine	80	0.02 (State Guidance)
Benzo(a)Anthracene	10	0.002 " "
Chrysene	10	0.002 " "
Benzo(b)Fluoranthene	10	0.002 " "
Benzo(k)Fluoranthene	10	0.002 " "
Benzo(a)Pyrene	10	ND
Indeno(1,2,3-cd)Pyrene	10	0.002 (State Guidance)
Chlordane	0.5	0.1

(1) Contract required detection limits

(2) ARARs are New York State groundwater standards except where noted.

(3) Applies to the sum of para (1,4-) and ortho (1,2-) isomers only.

development operations. In addition, directly above the borings and monitoring wells, readings did not typically exceed background levels by more than 2 parts per million (ppm). In a few cases, however, when borings were first drilled and when well caps were first removed, readings as high as 10 ppm above background levels were detected. These relatively high readings were found directly above the borings and wells, and they dropped rapidly (i.e., within one to two minutes) as vapors dissipated.

SUMMARY OF SITE RISKS

The methodology used in the following evaluation is consistent with that outlined in the USEPA Superfund Public Health Evaluation Manual, (October 1986).

The full list of detected chemical parameters were narrowed down to include those parameters listed in Tables 1 and 2. Some of the compounds from these tables were eliminated based on low concentrations present in soil, limited toxicity data available for the baseline risk assessment, or low potential for exposure. The remaining ten indicator chemicals for soil which are subjected to the baseline risk assessment are antimony, arsenic, lead, mercury, benzo(a) anthracene*, benzo(b) fluoranthene*, benzo(a) pyrene*, chrysene*, indeno (1,2,3-cd) pyrene* and dioxin.

Based on site conditions, it was determined that plausible routes of exposure for potential receptors for the 93rd Street School site would be inhalation of contaminated soils if they were entrained as a dust and inadvertent ingestion of contaminated soil (e.g., children playing on the site). Exposure via use of groundwater as a drinking water was not evaluated because the site is served with a public water supply, and the probability of drilling for a potable water supply in this area is extremely low.

In order to quantitatively estimate human exposure and potential health risk, two hypothetical scenarios were considered for the unremediated site: potential exposures at the undisturbed site; and potential exposure if soils were disturbed by persons unaware or unconcerned that the site contained potentially hazardous materials.

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* For this site, these high molecular weight PAHs are treated as a class of carcinogenic PAHs with carcinogenic potency equivalent to benzo(a) pyrene.

C Toxicological Information

The main route of exposure for toxic metals is primarily by ingestion of metal-contaminated food, water, and soil and by inhalation of metal-contaminated dusts or fumes. Dermal absorption is generally inefficient unless very high concentrations of a soluble salt are liberally applied. As a result, dermal absorption was not considered as a potential route of exposure in this assessment.

PAHs are formed as a result of combustion or natural petroleum synthetic mechanisms. PAHs are not generally intentionally synthesized, but are obtained by refining natural material for use as fuels, lubricants, preservatives, and starting materials for petrochemical manufacture. Only a subset of the general chemical category of PAHs have the potential to cause cancer. Five PAH compounds, which were mentioned previously, found at the site have EPA ratings of probable to possible human carcinogens. Of these compounds, only benzo(a) pyrene has experimental data sufficient for quantatively estimating carcinogenic potency. Therefore, in doing this risk assessment, it was conservatively assumed that other PAHs with probable or possible carcinogenic effects had a carcinogenic potency equal to that of benzo-a-pyrene.

Chlorinated dibenzo-p-dioxins are not intentionally synthesized. They exist as trace contaminants of synthetic chlorinated aromatic compounds such as pentachlorophenol and 2,4,5- trichlorophenox- yacetic acid or, as a combustion product of chlorinated compounds.

Limited data is available on human exposure to dioxin. It has been documented that exposure to dioxin in the workplace will produce chloracne. This appears to be the effect seen in humans that is most clearly correlated with dioxin exposure. Dioxin has also been shown to be extremely toxic to certain laboratory animals. It has been demonstrated that 2,3,7,8-tetrachlorodibenzo-p-dioxin causes tumors in rats and this finding has been used for dose-response assessment.

C Risk Assessment Results

The baseline risk assessment for this site (See RI Section 6) concludes that under the no-action alternative, a theoretical cumulative cancer risk of 2.4×10^{-4} may exist for the undisturbed site scenario. If the site were disturbed without careful implementation of direct contact and dust control measures, then an even greater cumulative cancer risk of 1.3×10^{-3}* could be posed. The risk

* The value presented in the RI risk assessment for total carcinogenic risk for the inhalation exposure (disturbed scenario) is 1.8×10^{-5}, but should have instead been reported as 2.8×10^{-7}. However, this does not change the overall conclusions in the risk assessment because the total cumulative cancer risk for the disturbed site remains $l.3 \times 10^{-3}$.

posed by the ingestion case contributes almost all of the risk, i.e., 2.3 x 10^{-4} and 1.3 x 10^{-3} for the undisturbed and disturbed site scenarios, respectively.

The primary contaminants contributing to this unacceptable risk are arsenic, PAHs and dioxin, and the primary route of exposure for these contaminants is through inadvertent ingestion of soils (e.g., children playing at the site).

The cancer risks noted above and further detailed in the RI/FS baseline risk assessment were based on utilizing maximum concentrations of contaminants for the soil ingestion scenarios (i.e., undisturbed and disturbed site). Even if average concentrations are used in the ingestion scenarios, total cumulative carcinogenic risks of 3.2 x 10^{-5} and 7.1 x 10^{-5} are derived for the undisturbed and disturbed site, respectively. Again, most of this risk is accounted for by the ingestion case, i.e., 2.6 x 10^{-5} and 7.1 x 10^{-5} for the undisturbed and disturbed site scenarios, respectively. Additionally, even assuming arguendo that the carcinogenic potency factor for dioxin were reduced by a factor of 16, as suggested by one commentor, the risk posed by the site would still be unacceptable.

Regardless of whether or not the site is disturbed, it is unlikely that the non-carcinogenic contaminants will pose a significant toxic effect.

USEPA concludes that the risks posed by the above described scenarios are unacceptable. Implementation of the no-action alternative would lead to continued unacceptable cancer risk at this site. Human health and the environment would not be protected on a short-term basis since particles in contaminated surface soils may become airborne, or come into direct contact with humans or other environmental receptors at the site. Over the long-term, it is anticipated that potential exposure risks may increase since wind and surface water erosion could expose greater portions of the deeper, more contaminated soils. In addition, the no-action alternative would not be consistent with CERCLA § 121 statutory preference for utilizing remedies which employ treatment as their principal element to reduce toxicity, mobility or volume of the contaminants at the site.

Based on the results of the baseline risk assessment and a locational determination of the contaminants at the site, a hot-spot area containing approximately 7,500 cubic yards of soil was identified at the site where arsenic, PAHs and dioxin (detected in previous investigations) are present at significantly higher levels than identified in other soils at the site.

A description of the analytical methods that were used in making these risk calculations are provided in the RI report and in the responsiveness summary.

DOCUMENTATION OF SIGNIFICANT CHANGES

USEPA and NYSDEC have identified in the PRAP that on-site solidification of the hot-spot soils is their preferred alternative for remediation of the 93rd Street School site.

Based on CERCLA Section 117(b) requirements, USEPA and NYSDEC determined that no significant changes have been made to the proposed remedy from the time it was originally proposed in the PRAP to final adoption of the alternative in the ROD.

DESCRIPTION OF ALTERNATIVES

As a result of the alternative's development and initial screening process, a total of six remedial action alternatives were developed for detailed evaluation for the 93rd Street School site. Two containment options, three treatment options and the no-action alternative were carried through to this step. These six feasible remedial alternatives, and their associated capital, annual operation and maintenance (O&M), and total present worth costs are provided in Table 6. This table also provides the estimated time to implement each remedial alternative from the completion of the ROD.

This section provides a brief description of the six feasible remedial alternatives. A more detailed description of the alternatives development and screening process can be found in the FS.

Alternative 1- No-Action with Site Monitoring

This alternative would allow the site to remain in its existing condition. The contaminated soils would be left in place in an uncontained and untreated condition and long-term monitoring of the groundwater and surface water would be performed as well as maintenance of the paved areas adjacent to the school and the existing vegetative cover. The maintenance and monitoring would be consistent with the relevant and appropriate requirements of the Resource, Conservation and Recovery Act (RCRA) regulations, 40 CFR Part 264, Subpart F, and 40 CFR § 264.117.

This alternative would result in potential exposure of humans to contaminants of unacceptable exposure levels. Over time, risks from these exposures might increase as more contaminated soils would become exposed due to wind and surface water erosion.

Table 6 — Remedial Alternatives Summary

Alternative Number	Components	Estimated Total Costs ($ x 10^6) Capitol	Annual O & M	Present Worth**	Estimated Time to Implement from ROD	Comments
1	No Action with Site Monitoring	-	0.2	2.0	3 mo.	Will not protect human health and environment.
CONTAINMENT OPTIONS						
2	Installation of a low permeability soil cover	1.3	0.2	3.0	3 yrs.	Hot-spot soils exceed 1 ppb level of concern for dioxin. High O&M.
3	Excavation of soil hot-spot areas, off-site disposal of those soils at RCRA landfill and installation of low permeability soil cover	3.7	0.1	4.8	3 yrs.	Doesn't meet RCRA land disposal restrictions. High long-term protection at site but not off-site. High short-term risks from transportation.
TREATMENT OPTIONS						
4*	Excavation of soil hot-spot areas, on-site solidification of contaminated soils and installation of a low permeability soil cover.	2.3-3.7	0.1	3.4-4.8	3 yrs.	Reduces toxicity and mobility of organics and inorganics. Permanently immobilizes the waste. Protects human health and environment. Meets ARARs. Low O&M.
5	Excavation of soil hot-spot areas, on-site thermal treatment of contaminated soils at the 93rd Street School and installation of a low permeability soil cover					
	A) Case 1- Disposal of treated byproducts at RCRA landfill	10.0	0.1	10.7	5 yrs.	Reduces toxicity and mobility. Destroys or-ganics. Further treatment (solidification) of the byproducts may be required if metals remain. Meets ARARs and protects human health and environment. Low O&M.
	B) Case 2- Solidification of byproducts followed by on-site disposal	8.7-10.0	0.1	9.7-11.1	6 yrs.	
	C) Case 3- Treated byproducts disposed on-site	7.8	0.1	8.9	5 yrs.	
6	Excavation of soil hot-spot areas, on-site thermal treatment of contaminated soils in the proposed thermal unit sited at Love Canal proper and installation of a low permeability soil cover					
	A) Case 1- Same scenario as Alternative 5	8.8	0.1	9.9	6 yrs.	Same as Alternative 5. Treatment would have to coincide with sewer & creek sediment burn.
	B) Case 2 " " "	7.4-8.8	0.1	8.5-10.0	7 yrs.	
	C) Case 3 " " "	6.6	0.1	7.7	6 yrs.	

* Preferred Remedial Alternative.
** Present worth is calculated based on a discount rate of 10% and a performance period of twenty-five years.
The low permeability cover would be placed over the hot-spot soils and extended to other areas which exhibit lower level of contaminated soils on-site.

Alternative 2 - Containment with Low Permeability Soil Cover

Construction of a low permeability cover at the 93rd Street School site would be performed with the intent of containing the wastes on-site, thereby preventing impacts associated with migration of contaminants via air or surface water at the site and to prevent direct contact risks. The cover would be designed and constructed so that it would have the following capabilities:

(1) Provide long-term minimization of migration of liquids through the underlying contaminated soils;

(2) Function with minimum maintenance;

(3) Promote drainage and minimize erosion or abrasion of the cover;

(4) Accommodate settling and subsidence so that the cover's integrity is maintained; and

(5) Have a permeability less than or equal to the permeability of the natural subsoils underlying the contaminated fill materials.

The cover would be placed over both the hot-spot soil areas and extended to other areas which exhibit significantly lower levels of contaminated soils on-site. It is expected that the cover would encompass an area of approximately eight acres. The specific characteristics and thickness of the cover would be determined during the remedial design phase. It is anticipated that in order for the covered area to drain properly, the site would be regraded to ensure effective surface runoff.

Long-term monitoring would be required with this alternative to ensure that contaminants are not leaching into the groundwater or surface water. Periodic inspections of the cover and paved areas would be required consistent with RCRA § 264.117, and any cover damage detected would require prompt correction.

This alternative would comply with RCRA Subtitle C (40 CFR § 264.310) landfill closure requirements. Since wastes are not being placed with this alternative, RCRA Land Disposal Restrictions (LDRs) would not apply. The groundwater monitoring associated with this alternative would comply with RCRA 40 CFR Part 264, Subpart F requirements for groundwater monitoring.

To comply with CERCLA Section 121(c), since wastes would remain on-site following implementation of this alternative, a review of the performance of the cover would be conducted at least every five years to ensure that the remedy continued to provide protection of human health and the environment.

Alternative 3 - Soil Hot-Spot Excavation, Off-site Disposal at a RCRA Landfill and a Low Permeability Cover

This option involves excavating all identified hot-spot soils followed by transportation of these soils to an approved off-site RCRA landfill. It has been estimated previously that the quantity of hot-spot soils requiring remediation at the site would be approximately 7,500 cubic yards. Following excavation, the excavated areas would be filled with clean fill from an off-site location, then a low permeability cover as described in Alternative 2 would be place over the approximately eight acre area.

Control technologies that would be required during implementation of this alternative would include: respiratory and protective clothing for workers at the site; decontamination equipment; dust controls which could include water spraying, windscreening, and temporary surface water controls to prevent migration of contaminants off-site. In addition, chemical dust suppressants may be required to control volatilization of organics.

Long-term groundwater monitoring and maintenance requirements would be similar to those described previously for the low permeability cover (Alternative 2). Monitoring requirements might be reduced since hot-spot soils would no longer be present at the site. Consistent with the relevant and appropriate requirements of 40 CFR § 264.117, the Regional Administrator has the authority to reduce the post-closure care if it is determined that the reduced period is sufficient to protect human health and the environment (e.g., groundwater monitoring results, or alternative disposal or reuse techniques indicate that the facility is secure).

A potentially limiting factor of this alternative is the fact that prior to disposal at the off-site RCRA landfill, it may have to be demonstrated that the hot-spot soils would meet LDR requirements. LDR standards have not been promulgated for soil and debris waste (except for dioxin, which requires the leachate from treated soils to be less than 1 ppb), but when promulgated, the standards may be relevant and appropriate.

Methods such as the Toxicity Characteristic Leaching Procedure (TCLP) and total waste analysis could be utilized to determine if the soils meet the LDR levels. For Alternative 3, without prior treatment of the hot-spot soils, it is possible that they would fail the TCLP or total waste analysis test (at least for dioxin at this time) and, therefore, off-site land disposal of these soils after November 8, 1988 (the date which LDR requirements for soil and debris are expected to take effect), may not be allowed. Off-site land disposal without prior treatment is also the least preferred alternative under CERCLA.

Option 3 must also comply with CERCLA Section 121(d)(3) regarding off-site disposal of hazardous waste. This section requires that the off-site facility be operating in compliance with all federal (e.g., RCRA) and state requirements. As a result, the hot-spot soils from the site may only be transferred to an off-site facility if the landfill unit that will accept the soils is not releasing any hazardous waste into the groundwater, surface water or soil, and all releases from other units at that facility are being controlled by a RCRA corrective action program.

Since the hot-spot soils would be sent off-site, RCRA 40 CFR Part 262, Subparts A through D manifesting and transportation requirements would be followed. In addition, the soils would not require significant temporary storage prior to transportation.

Alternative 4 - Soil Hot-Spot Excavation, On-Site Solidification of Soils, and a Low Permeability Cover

Alternative 4 involves the solidification/stabilization of the contaminated soils. The soil hot-spots would be excavated and then solidified utilizing a transportable treatment unit located at the 93rd Street School site.

The solidification treatment would involve blending the soils in mixing tanks with additives which would reduce the toxicity and mobility of the contaminants and would permanently immobilize the waste. If the transportable solidification treatment unit is not a closed system, controls may be required for potential emissions. Additives typically introduced during the solidification process include cement, silicates, polymers and proprietory additives which chemically stabilize the organics in the contaminated soil for optimum solidification. Once the additives are mixed with the soil, the final product may resemble concrete or hardened clay. The treatment of soils would comply with the appropriate treatment standards of 40 CFR Part 264.

Prior to implementation of this alternative, a treatability study would be conducted during the remedial design phase to ensure the effectiveness of this technology and its capability of reducing the total waste concentration and any possible leachate from the treated soils to levels below applicable or relevant and appropriate treatment standards (e.g., LDR requirements). Should the treatability study determine that solidification would not provide the desired degree of treatment, then treatability studies would be performed to determine the effectiveness of other treatment techniques (including thermal treatment) for the on-site soils.

If the solidified soil meets all treatment level requirements, then the treated soil would be redeposited in the same unit of contamination from which it originated. A low permeability cover would then be placed over the area (as discussed in Alternative 2) and monitored consistent with the technical requirements for closure and post-closure (e.g., RCRA 40 CFR § 264.310). The remedial activities of Alternative 4 would also comply with the general and record keeping requirements of 40 CFR Part 262, Subparts A and D, respectively.

Long-term monitoring, consistent with RCRA regulations, 40 CFR Part 264, Subpart F, of the groundwater and surface water would be required with this alternative as well as monitoring and maintenance of the cover as described in Alternative 2. Post-closure requirements might be reduced, however, as discussed in Alternative 3.

Control technologies required during implementation of this alternative would be essentially the same as those described previously for off-site RCRA landfill disposal of the soils. It is not anticipated that significant stockpiling of the excavated soils would occur prior to the solidification treatment. On-site storage of soils prior to and after treatment and prior to disposal would comply with 40 CFR § 262.34 or 40 CFR Part 264 storage requirements.

Since the solidified soil will remain on-site, this remedy would be reviewed at least every five years to ensure that human health and the environment continue to be protected.

<u>Alternative 5 - Soil Hot-Spot Excavation, On-Site-Thermal Treatment of Soils at the 93rd Street School, and a Low Permeability Cover</u>

This alternative involves excavation of the hot-spot soil areas followed by on-site thermal treatment of these soils at the 93rd Street School site utilizing a transportable unit and residuals disposal into the same unit of contamination from which they originated. A low permeability cover would then be placed over the area (as discussed in Alternative 2) and monitored and maintained.

On-site thermal treatment would be performed with the intent of permanently treating the hot-spot soils so that treatment by-products would meet LDR treatment levels prior to disposal at the 93rd Street School site (Case 3). If, however, no thermal treatment unit were available which could achieve these levels by itself (due to the metal contaminants present in the soils), then an additional technology capable of reducing the remaining levels of the contaminants in the byproducts could be utilized. Following thermal treatment, the partially treated byproducts could then be disposed of either on-site following treatment via a solidfication technology capable of meeting the LDR treatment levels (Case 2) or at an approved off-site landfill (Case 1).

Control technologies required during the excavation would be similar to those described previously for the off-site RCRA landfill disposal and solidification/stabilization alternatives. If feed preparation operations such an pulverization or drying were required, then controls would be warranted to minimize worker contact with the soils during handling operations, to minimize particulate and possibly volatile emissions, and to minimize noise pollution. During thermal treatment, air pollution controls would be required to prevent potential escape of hazardous byproducts. Finally, if the treatment byproducts were hazardous, workers would have to be equipped with the appropriate respiratory and other protection equipment to handle the partially treated ash and scrubber waters. Process wastewater from thermal treatment could be treated at the Love Canal Leachate Treatment Facility. All federal and state ARARs would be complied with for storage and treatment of these wastewaters.

To reduce storage requirements prior to treatment, it is anticipated that the hot-spot soils would be excavated in a batch mode rather than excavate and stockpile all the soils at once.

The time required for thermal treatment of the hot-spot soils could vary from aproximately 12 to 21 months based on 24 hours/day, 365 days/year, and a 75 percent efficiency operation, depending upon the transportable unit selected. It is anticipated that a treatability study followed by a test burn would be required prior to selection of a final thermal treatment unit for use at the site to determine the level of treatment attainable, the effectiveness of air pollution controls, and the time required for treatment. The test burn would also help to indentify any problems associated with thermally treating the hot-spot soils from the 93rd Street School site. Analysis of the byproducts from the treatability study and test burn could be used to establish whether or not they would be capable of meeting LDR treatment requirements and, therefore, whether off-site RCRA landfill disposal (Case 1), solidification/stabilization (Case 2) or direct on-site disposal (Case 3) would be appropriate.

Maintenance and monitoring requirements for all cases would include maintenance of the transportable thermal treatment unit and the low permeability cover, and monitoring of groundwater, emissions and byproducts to ensure protection of human health and the environment.

Since the treated soil would remain on-site in Cases 2 and 3, this remedy would be reviewed at least every five years to ensure that the remedy continued to provide protection of human health and the environment. If the treated byproducts are sent to an off-site facility (Case 1), then applicable RCRA 40 CFR Part 262 Subparts A through D manifesting and transportation requirements would be required.

This remedy would comply with RCRA § 264 Subpart 0 requirements for incineration units. Subpart 0 specifies design requirements for operation of hazardous waste incinerators. In addition, the thermal treatment unit would comply with State requirements prohibiting general air pollution and controlling air emissions from process sources. The site would also be closed in accordance with landfill closure under 40 CFR § 264.310 (RCRA Subtitle C).

<u>Alternative 6 - Soil Hot-Spot Excavation, On-Site Thermal Treatment of Soils at Love Canal Proper, and a Low Permeability Cover</u>

This alternative involves the same steps as Alternative 5 (thermal treatment at the 93rd Street School) except that the hot-spot soils would be thermally treated at Love Canal proper.

This alternative is possible because USEPA has previously selected on-site thermal treatment as the remedy for the creek and sewer sediments project (see Record of Decision--Love Canal Site, October 26, 1987). Under the selected remedy, a transportable thermal treatment unit will be located at Love Canal proper, therefore, it is feasible that the hot-spot soils from the 93rd Street School site could be treated in this same unit. However, as mentioned previously, a treatability study and test burn would have to be performed prior to implementation of this alternative to ensure its continued effectiveness.

This alternative would differ from Alternative 5 in that transportation of the hot-spot soils to the transportable thermal treatment unit located at Love Canal proper would be required. Since both the Love Canal - 93rd Street School site and the Love Canal proper are located within the EDA, and are, therefore, considered one site, RCRA manifests would not be required for transportation of the contaminated soils to the treatment unit, or for transportation of the treated byproducts back to the 93rd Street School site for disposal. However, if the treated byproducts are sent to an off-site RCRA landfill (Case 1), then applicable RCRA 40 CFR Part 262, Subparts A through D manifesting and transportation requirements would be required.

The time required for thermal treatment of the hot-spot soils is dependent upon the creek and sewer remediation schedule. It is anticipated that thermal treatment of the creek and sewer sediments would be initiated in 1992, thereby delaying excavation and treatment of the 93 Street School site hot-spot soils until that time.

As is the case with Alternative 5, thermal treatment of the soils would comply with all applicable requirements of 40 CFR Part 264, Subpart 0 of RCRA and more stringent state regulations pertaining to incinerators. In addition, thermal treatment operations, closure requirements, cover maintenance, groundwater monitoring and storage and treatment requirements for process wastewaters would be the same as Alternative 5.

SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

The above six alternatives were evaluated using evaluation criteria derived from the NCP and CERCLA. These criteria relate directly to factors mandated by CERCLA in Section 121 including Section 121(b)(1)(A-G). The criteria are as follows:

- Protection of human health and the environment
- Compliance with ARARs
- Reduction of toxicity, mobility or volume
- Short-term effectiveness
- Long-term effectiveness and permanence
- Implementability
- Cost
- State acceptance
- Community acceptance

A summary of the relative performance of the alternatives with respect to each of the nine criteria is provided below.

- Protection of Human Health and the Environment

Protection of human health and the environment is the central mandate of CERCLA. Protection is achieved primarily by reducing health and environmental threats to acceptable levels and taking appropriate action to ensure that there will be no unacceptable risks to human health and the environment through any exposure pathway.

Except for the no-action alternative, all the alternatives evaluated afford adequate protection of human health and the environment. The no-action alternative will not be capable of adequately protecting human health and the environment on a short-term basis since particles in contaminated surface soils may become airborne, transported via surface water runoff or come into direct contact with humans or other environmental receptors at the site. Over the long-term, it in anticipated that potential exposure risks may increase since wind and surface water erosion could expose greater portions of the contaminated soils. Since the no-action alternative cannot satisfy this fundamental requirement, it will not be considered further.

Alternatives 2 through 6 all afford adequate protection of human health and the environment, although they achieve this through different means. Containment Options 2 and 3 achieve protection through controlling exposure to the waste. Treatment options 4 through 6 achieve protection through a reduction of the inherent hazard posed by the contaminants in addition to controlling exposure to residuals.

Alternatives 2 and 3 physically contain the contaminants on-site and off-site, respectively. Alternative 3 ensures greater level of protection in the long-term since the hot-spots would be excavated, however, there may be some short-term risks associated with excavation and transportation. Alternative 2 provides the greatest protection in the short-term, however, there is a higher degree of uncertainty in the long-term if the hot-spot soils are eventually exposed through the cover. As a result, significant health risks may be posed.

Of the treatment options, solidification (Alternative 4) is expected to permanently immobilize the hot-spot soils and eliminate any potential for leaching of both organic and inorganic contaminants. All threats associated with soils ingestion, inhalation and dermal contact would be eliminated. During the treatability study for solidification, it must be demonstrated that deterioration of the solidified/stabilized hot-spot soils will not occur such that the residuals will pose a significant risk as a result of erosion.

Thermal treatment (Alternatives 5, 6B and 6C) would provide essentially comparable effectiveness to solidification, assuming that the byproducts meet all treatment level requirements, specifically, heavy metals.

Alternatives 5A and 6A would result in comparable effectiveness at the site, however, the effectiveness provided near the off-site facility is dependent on proper maintenance of the landfill.

All alternatives except for the no-action alternative would include adherence to a site specific health and safety plan to protect workers during implementation. Occupational Safety and Health Administration requirements, as well as more stringent state regulations would be followed by workers at the site to minimize the potential for harmful exposure and remediation related accidents.

- <u>Compliance with Applicable or Relevant and Appropriate Requirements</u>

Section 121(d) of CERCLA requires that remedial actions comply with all ARARs to the extent that hazardous substances are present on-site. Alternatives 2 through 6 would attain their respective ARARs.

Although the area is served by a municipal water supply and the groundwater at the site is not currently used, nor is it planned to be used as a drinking water source, samples were taken and analyzed. Those analyses indicate that a non-health-based New York State secondary groundwater standard for aesthetics (taste and odor) for iron was exceeded at the site, and that the groundwater and surface water at the site are not otherwise contaminated at levels exceeding CRDLs. Those analyses also indicate that, for certain compounds, the groundwater and surface water did not exceed health-based ARARs. For other compounds, however, the CRDLs used during the RI exceeded both New York State and USEPA drinking water standards. In addition, some compounds detected exceeded guidance values and criteria considered. Consequently, additional sampling of the groundwater was recently performed. The analysis (with the lowest achievable levels of detection) will determine whether groundwater ARARs and other criteria to be considered are being exceeded. The results are anticipated to be available in the fall of 1988, and may be considered in any subsequent decision on groundwater or surface water remediation.

Based upon the LDR provisions, RCRA hazardous waste in accordance with 40 CFR Part 261 (i.e., hazardous waste is defined as listed or characteristic) which is excavated, treated and then redeposited in the same unit of contamination constitutes placement and, therefore, the LDR requirements are potentially applicable or relevant and appropriate.

To determine whether a waste is a listed RCRA hazardous waste, it is necessary to know the source or use of the waste. When it is not possible to make an affirmative determination that the wastes are listed RCRA hazardous wastes, RCRA requirements are not applicable to CERCLA actions, but may be relevant and appropriate if the CERCLA action involves treatment, storage or disposal and if the wastes are similar or identical to RCRA hazardous wastes. Because it has not been determined with certainty whether the wastes at the 93rd Street School site are RCRA listed hazardous wastes, EPA has determined that the RCRA LDR requirements are not applicable.

Although the LDR requirements are not applicable in terms of a listed hazardous waste, they may be applicable if the waste is identified as RCRA characteristic hazardous waste. A RCRA characteristic hazardous waste is identified as a waste which exhibits the characteristics of either ignitability, corrosivity, reactivity or toxicity (using the extraction procedure (EP)).

The waste at the 93rd Street School site do not exhibit the characteristics of ignitability, corrosivity or reactivity. In addition, due to the binding qualities of the fill material at the site and its ability to tie-up the contaminants within the soil/fill matrix, it is also improbable that the wastes exhibit EP toxicity characteristics. Furthermore, the contaminants would be immobilized after treatment (i.e., at the time placement of the waste will occur). As a result, the LDR requirements are also not applicable in terms of RCRA characteristic hazardous waste.

Although the LDR requirements are not applicable because the waste is not a RCRA hazardous waste, the LDR requirements are still potentially relevant and appropriate. Dioxin LDR standards based upon analysis of treated soil have been promulgated for soil and debris waste. (These standards require the leachate from treated soils to be less than 1 ppb). Accordingly, the dioxin waste at the 93rd Street School is sufficiently similar to LDR dioxin waste, 40 CFR Part 268, Subpart C. Therefore, EPA believes that the LDR standards for dioxin are relevant and appropriate for this site.

EPA is undertaking an LDR rulemaking that will specifically apply to soil and debris. Until that rulemaking is completed, the CERCLA program will not consider LDR to be relevant and appropriate (except for dioxin) to soil and debris that does not contain RCRA restricted wastes.

Following solidification, the treated soils would then be redeposited back on-site in the same unit of contamination from which they originated, with a low permeability cover having a permeability less than or equal to the permeability of the natural subsoils, placed over the area. Therefore, these alternatives are consistent with landfill closure requirements under 40 CFR § 264.310 (RCRA Subtitle C). Under the above approach, RCRA minimum (design and operating) technology requirements (e.g., double liner/leachate collection system) would not be triggered since a new unit in not being constructed nor is replacement or lateral expansion of the existing unit occuring.

Containment Option 3 would not comply with the LDR requirements unless the hot-spot soils meet the treatment levels, using testing procedures such as the TCLP and total waste analysis. This alternative would also need to comply with CERCLA § 121 (d)(3) regarding off-site disposal of hazardous waste. This requires that the off-site facility be operating in compliance with all federal (i.e., RCRA) and state requirements.

While permits are not required for on-site remedial actions at Superfund sites, any on-site action must meet the substantive technical requirements of the permit process. The site excavation options (3, 4, 5 and 6) will comply with all federal and state requirements concerning potential air emissions (particulates and volatiles) during the excavation of the hot-spot soils. Thermal treatment of the soils (Options 5 and 6) would comply with all the requirements of 40 CFR Part 264, Subpart 0 (RCRA) and more stringent state regulations pertaining to incinerators. Specifically, operation of an on-site thermal treatment unit would require that the transportable unit undergo waste specific trial of demonstration burns to demonstrate satisfactory destruction of the toxic components of the waste. The trial or demonstration burn must show that the unit achieves 99.9999% destruction and removal efficiency (DRE) for dioxin and 99.99% DRE for the remaining contaminants, and controls air emissions of products of incomplete combustion, acid gases and particulates to specified levels.

Options 3, 5A and 6A which involve off-site shipment of waste would comply with the requirements of RCRA 40 CFR Part 262, Subparts A through D regarding manifesting and transportation.

A location-specific ARAR which would be complied with for all the alternatives is the National Historic Preservation Act. A determination of whether the alternatives would have any affect on cultural resources would be made during the design phase.

- <u>Reduction of Toxicity, Mobility or Volume</u>

This evaluation criteria relates to the performance of a remedial alternative in terms of eliminating or controlling risks posed by the toxicity, mobility or volume of hazardous substances.

Solidification is expected to permanently immobilize the hot-spot soils, thereby, eliminating any exposure to toxicity threats posed by the contaminants. Any future leaching of contaminants from the solidified soil and risks due to soils ingestion in the treated areas would also be eliminated by this option. The thermal treatment options would destroy the organics (including dioxin), and any toxicity that may remain due to the heavy metals in the byproduct could be remediated either through solidification (options 5B or 6B) or off-site disposal (Options 5A or 6A). However, the toxicity, mobility or volume would not be reduced with the off-site disposal options. Thermal treatment would also eliminate future mobility of the waste.

The containment options (Alternatives 2 and 3) would reduce exposure to the waste but would not achieve a reduction in toxicity, mobility or volume through treatment.

The volume of the hot-spot soils consisting primarily of inert materials would not be significantly reduced following thermal treatment. The volume of the vegetative layer of soils from the hot-spot area, however, might be significantly reduced because of the higher percentage of organic materials in this layer.

The long-term mobility of the hot-spot soils would be reduced by thermal treatment since the contaminants would be destroyed, but there would be an increase in the mobility of contaminants over the short-term due to air release of products of incomplete combustion and increased materials handling. This would be controlled through careful handling and operational procedures for the thermal treatment process (i.e., scrubbers, etc.). There could also be an increase in the mobility of contaminants during the solidification process over the short-term due to increased materials handling.

With solidification, due to the addition of the fixation agents, the volume of waste material would likely increase.

- Short-Term Effectiveness

Short-term effectiveness measures how well an alternative is expected to perform, the time to implement the action, and the potential adverse impacts of its implementation.

The low permeability cover installed with Alternative 2 would virtually eliminate existing risks on a short-term basis since it would not be necessary to disturb the contaminated soils. However, minor exposure during use of construction equipment on the surface soils prior to placement of the cover could occur.

The excavation options would increase the short-term risks from air emissions, and additional risks to communities along the transportation route would be incurred as a result of the off-site transportation of the hot-spot soils with Alternative 3.

Approximately four hundred 20 cubic yard truck loads of soil would have to be transported to the off-site RCRA facility. Therefore, risks due to soils spillage or an overturned truck could occur.

On-site solidification (Option 4) would significantly reduce existing risks at the site once the hot-spot soils are treated. However, both the solidification and thermal treatment alternatives would result in short-term risks from excavation. In addition, thermal treatment may result in air emissions, however, as mentioned previously, strict measures would be implemented to ensure that such emissions would not be harmful to human health and the environment. Thermal treatment may also require additional materials handling on-site, such as pretreatment (e.g., shredding and crushing) of the contaminated soils prior to feeding to the thermal treatment unit.

The time to implement each remedial alternative, except for the thermal treatment alternatives, is approximately three years from the signing of the ROD. Depending on the method of disposal of the byproducts following thermal treatment, the time to implement Alternatives 5 and 6 could vary from approximately five to seven years. It should be noted that thermal treatment of the 93rd Street School site hot-spot soils at Love Canal proper would begin in 1992, thereby, coinciding with thermal treatment of the creek and sewer sediments schedule.

- <u>Long-Term Effectiveness and Permanence</u>

Long-term effectiveness and permanence addresses the long-term protection and reliability of an alternative.

Over the long-term, the on-site solidification and thermal treatment options provide essentially comparable effectiveness to the local community, since the byproducts are not expected to pose a hazard from a health and environmental perspective. However, thermal treatment is not an effective technology for the inorganic contaminants in the soils. The inorganics tend to slag (depending on their volatility) and remain in the byproducts. Further treatment or off-site disposal of the byproducts may, therefore, be required (i.e., Alternatives 5B, 6B and 5A, 6A, respectively).

Treatability studies would be performed during the design of both the solidification and thermal treatment alternatives to ensure their long-term effectiveness. During the treatability studies, the byproducts would be analyzed according to methods such as the TCLP and total waste analysis to determine the effectiveness each treatment procedure has in meeting the LDR treatment levels. Even though the solidification process would permanently immobilize the waste, the testing conducted during the treatability study would confirm the long-term effectiveness of this option. If this alternative is implemented, it is anticipated that any deterioration of the solidified material would be detected during routine monitoring. Should the deterioration be significant, then appropriate action would be taken to ensure protectiveness.

The effectiveness of the low permeability cover would be better than the no-action option, however, it is necessary to continually monitor the cover to ensure erosion would not result in exposure of the hot-spot soils. There is also the possibility that damage to the cover could occur due to a major earthquake (since this area has defined seismic activity) or a flood of a magnitude greater than 100 years.

The long-term effectiveness of Alternative 3 would be high at the site itself since the hot-spots would be removed, however, the contaminated soils would be deposited at an off-site RCRA facility.

All options in which wastes would remain on-site need to be reviewed at least every five years to ensure their continued effectiveness.

- Implementability

Implemetability addresses how easy or difficult it would be to carry out a given alternative. This covers implementation from design through construction and O&M.

The implementability of the alternatives is evaluated in terms of technical and administrative feasibility, and availability of needed goods and services.

Each alternative evaluated is technically feasible, however, treatment options 4, 5 and 6 would require treatability studies to determine the optimal conditions to satisfy the LDR treatment level requirements and provide a high degree of long-term effectiveness. Frequent monitoring of byproducts during operations would be needed to ensure system effectiveness and reliability.

The availbility of necessary equipment and specialists may be more limited for solidification than for the other alternatives since solidification of both organic and inorganics is a fairly recently demonstrated technology. However, based upon recent use of transportable units for this technology at other CERCLA sites (e.g., Pepper's Stool and Alloys site, Florida) and its widescale selection for other CERCLA sites in the country, a well-established market is becoming available for this technology for both organics and inorganics.

Thermal treatment implementation would vary in difficulty depending on the transportable unit selected and its associated pretreatment and operational requirements.

Sufficient area exists at the 93rd Street School site to set-up treatment units as called for in Alternatives 4 and 5 and there is ample land area available on-site for redeposition of the treated soil.

With Alternative 6 (thermal treatment at Love Canal proper), excavation of the hot-spot soils could either occur during the 1990 construction season (following the creek sediments excavation in 1989), allowing the soils to be temporarily stored with the creek sediments, or the 93rd Street School site hot-spot soils could be excavated just prior to thermal treatment during 1992, eliminating the requirements for temporary storage.

Implementation of a low permeability cover and off-site disposal (Alternatives 2 and 3, respectively) would not be difficult technically, however, administrative requirements with disposal of the waste off-site may prove substantial. Difficulties can be anticipated with finding an off-site disposal unit that is in compliance with RCRA regulations and facilities may not be capable or willing to accept the dioxin-contaminated waste.

The severe winter weather conditions in this area would limit the construction season for the alternatives, and the decreased winter temperatures may require additional precautions to maintain optimal reaction rates for the solidification option.

- Cost

Costs are evaluated in terms of capital, O&M and present worth.

While comparing treatment Alternatives 4, 5 and 6, which result in comparable effectiveness, solidification of the hot-spot soils has been identified as the lowest cost alternative. The total present worth cost for these options range from approximately \$3.4 to \$4.8 million for solidification to \$7.7 to \$11.1 million for thermal treatment. The lower end of the cost range for thermal treatment assumes treatment at Love Canal proper, with the byproducts meeting LDR treatment levels disposed on-site at the 93rd Street School site (Option 6C). The higher cost assumes treatment at the 93rd Street School site with the byproducts solidified (Option 5B).

The containment options (Alternatives 2 and 3) vary from approximately \$3 milllion to \$4.8 million, respectively.

As mentioned previously, Table 6 provides a summary of the capital, O&M and total present worth cost of each of the six alternatives. A more detailed breakdown of these costs are provided within the RI/FS.

- State Acceptance

This section addresses any concerns and degree of support the State has expressed regarding the remedial alternatives being evaluated.

The State supports a solution that involves treatment that reduces the inherent hazard posed by the contaminants for the Love Canal - 93rd Street School site. Its preference is on-site solidification/stabilization of the contaminated soils (Alternative 4), contingent upon the results of a treatability study which would be performed to ensure the effectiveness of the solidification process and its ability to meet specified treatment levels. Should the treatability study indicate that solidification of the soils would not provide the desired degree of treatment, then other treatability studies would be performed to determine the effectiveness of treating these soils on-site.

- Community Acceptance

This evaluation criterion addresses the degree to which members of the local community support the remedial alternatives being evaluated.

Both the draft RI/FS and the PRAP (Alternative 4) were made available during the public comment period and were presented at the public meeting. In general, the community indicated a preference for a treatment based alternative that reduces the inherent hazard posed by the contaminants at the site and many favored the solidification/stablization alternative.

Some residents expressed concern at the public meeting that solidification is not a proven technology. In response to their concerns, during the subsequent availability session and throughout the remainder of the public comment period, information concerning the demonstrated ability and performance of the soldification process was made available to the local community by both USEPA and NYSDEC.

Detailed responses to the community concerns are contained in the attached responsiveness summary.

SELECTED REMEDY

Based upon CERCLA, the detailed evaluation of the alternatives, and public comments, both USEPA and NYSDEC have determined that Alternative 4, soils excavation, on-site solidification and a low permeability cover is the most appropriate remedy for the 93rd Street School site. This remedy consists of the following components:

1. Excavation of approximately 7,500 cubic yards of contaminated soil followed by on-site solidification/stabilization of this material. Figure 3 illustrates the extent of identified hot-spot soils to be excavated. Additional testing will be conducted during the remedial design to further define the volume of soil needing excavation and treatment. It is anticipated that the current estimate of 550 cubic yards of dioxin-contaminated soil would be significantly reduced based on the results of this additional testing.

2. The solidified soil would be placed back on-site within the same unit of contamination from which it originated, with a low permeability cover installed over these areas and extended to other areas which exhibit lower levels of contaminated soils at the site.

3. Treatability studies will be conducted during the remedial design to determine the effectiveness of the solidification/ stabilization process for the particular soil and its ability to meet specified treatment levels (e.g., LDR treatment requirements). Should the treatability studies determine that solidification would not provide the desired degree of treatment, than treatability studies would be performed to determine the effectiveness of other treatment techniques (including thermal treatment) for the on-site soils. In addition to meeting the LDR treatment requirements, interim soil and debris treatment levels will be considered while evaluating the effectiveness of the solidification process during the treatability studies.

4. Since the solidified soil will remain on-site, the remedy will be reviewed at least every five years to ensure that human health and the environment continue to be protected.

5. Additional sampling (with the lowest achievable levels of detection) of the groundwater was conducted in May 1988 to ensure that ARARs for groundwater are not being exceeded. Should the analytical results indicate that groundwater standards and other criteria to be considered are exceeded, then an evaluation of the necessity for remediation of the groundwater would be conducted. Remediation of the groundwater, if warranted, would be addressed in a subsequent ROD.

6. A groundwater monitoring program would be established in accordance with RCRA regulations, 40 CFR Part 264, Subpart F.

7. One hundred percent of the remedial design will be funded by USEPA. Cost sharing for construction of the remedy is 90% USEPA and 10% State of New York.

Cost estimates for the selected remedial action are presented in Table 7.

- <u>Operation and Maintenance</u>

O&M are those costs required to operate and maintain the remedial action throughout its lifetime. These activities ensure the lifetime effectiveness of the remedial alternative selected.

Table 7

SOLIDIFICATION/STABILIZATION ALTERNATIVE COST ESTIMATE

CAPITAL EXPENSE ITEMS	QTY.	UNITS	UNIT COST	TOTAL COST	
1. Preliminary Testing & Approvals	---	---	$100,000	$100,000	
2. Hot Spot Soil Excavation	7,500	Cu. Yd.	$5.00	40,000	
3. Hot Spot Pavement Excavation	3,000	Sq. Yd.	8.00	25,000	
4. Solidification/Stabilization	11,250*	Ton	50.00	565,000	to
* 7500 cu.yd. x 1.5 tons/cu.yd.= 11,250 tons			to 150.00	1,690,000	
5. Sampling/Analysis of Treated Soils	15	Sample	1,000.00	15,000	
6. Redisposal of Treated Soils	7,500	Cu. Yd.	5.00	40,000	to
	to 13,000			65,000	
7. Reconstruct Paved Areas					
a. Base	3,000	Sq. Yd.	5.00	15,000	
b. Pavement, 3" thick	3,000	Sq. Yd.	7.00	25,000	
8. Place Low Permeability Cover-------See Table 4-6-----------------				1,085,000	
			Sub-Total:	$1,910,000	to
				$3,060,000	
			20% Eng. and Reg. Contingency:	$ 385,000	to
				$ 615,000	
			TOTAL:	$2,295,000	to
				$3,675,000	

PERIODIC EXPENSE ITEMS				TOTAL COST/YR
1. Semi-Annual Site Inspection	50	Manhr./Yr.	$50.00	$2,500
2. Quarterly Groundwater Monitoring	52	Sample/Yr.	1,300.00	68,000
3. Detailed Evaluation (every 5 years)	0.2	Eval/Yr.	100,000.00	20,000
4. Maintenance				
a. Cover Maintenance				2,500
b. Misc. Maintenance				7,500
			Sub-Total:	$100,500
			20% Eng. and Reg. Contingency:	20,500
			Total:	

O&M requirements (primarily for groundwater monitoring and maintenance of the low permeability cover) are eligible for Superfund monies for a period of up to one year to assure the effectiveness of the remedy. Following that year, any additional O&M costs would be the responsibility of the State.

As part of the remedial action, a long-term groundwater sampling program is included to monitor changes in the nature and extent of contamination at the site to determine the effectiveness of the remedy.

- <u>Future Actions</u>

This ROD addresses the source of contamination by remediation of the on-site contaminated soils. The remedy will address the principal threats at the site by permanently immobilizing the soils at the 93rd Street School site, thereby preventing any future groundwater contamination and reducing the risks associated with exposure to the contaminated soils.

Additional sampling of the groundwater was conducted in May 1988. The analysis of these samples (with the lowest achievable levels of detection) will determine whether groundwater ARARs and other criteria considered are being exceeded. The results are anticipated to be available in the fall of 1988, and may be considered in any subsequent groundwater remediation. Remediation of the groundwater, if warranted, would be addressed in a subsequent ROD.

The selected remedy is not expected to encroach upon the 100-year floodplain. However, if it is determined during the remedial design that any portion of the low permeability cover would be located within the 100-year floodplain, then appropriate measures such as a floodplain assessment may be performed.

An evaluation of the area for the potential discovery of unidentified cultural resources is necessary. Accordingly, under the National Historic Preservation Act, a cultural resources (Stage 1A) survey would be performed during the remedial design phase to determine whether the selected remedial action will have any affect on resources or whether the site is eligible for nomination to the National Register of Historic Places.

<u>STATUTORY DETERMINATION</u>

The selected remedy best achieves the goals of the nine evaluation criteria in comparison to the other alternatives.

Solidification/stabilization is expected to permanently immobilize the hot-spot soils and eliminate any potential for leaching of both organic and inorganic contaminants. All threats associated with soils ingestion, inhalation and dermal contact would be eliminated.

With the solidification option, short-term risks from excavation of the hot-spot soils would occur, however, strict measures would be implemented to ensure that such emissions would not be harmful to human health and the environment. During implementation, portions of the contaminated soils would be excavated at a time and then solidified. This method would eliminate any significant stockpiling of the contaminated soils prior to treatment, thereby, reducing short-term risks from direct contact and inhalation.

The selected remedy would comply with federal and state requirements regarding fugitive volatile and particulate emissions during excavation. The applicable New York State air and hazardous waste requirements for excavation which would be complied with include 6 NYCRR Part 257 and Part 373, which regulate ambient air standards, and control particulates from waste piles, respectively. Part 211 also contains general prohibitions against air pollution and it gives the State discretion in requiring controls. Controls that are typically utilized are water spray and chemical dust suppressants to control fugitive particulate emissions and volatilization of organics. In addition, Part 212 may also apply to the solidification process, thereby, requiring controls on emission sources. The federal requirements that will be complied with during excavation include 40 CFR Part 50 and § 264.25(f), which control ambient air standards and control of particulates from waste piles, respectively.

Based upon the LDR provisions, RCRA hazardous waste (listed or characteristic) which is excavated, treated and then redeposited in the same unit of contamination constitutes placement and, therefore, the LDR requirements are potentially applicable or relevant and appropriate.

Because it has not been determined with certainty whether the wastes at the 93rd Street School site are listed hazardous wastes, EPA has determined that the RCRA LDR requirements are not applicable. In addition, the waste at the site do not exhibit the characteristics of ignitability, corrosivity or reactivity, and it is also improbable that the wastes exhibit EP toxicity characteristics. As a result, the LDR requirements are also not applicable in terms of RCRA characteristic hazardous waste.

Dioxin LDR standards based upon analysis of treated soil have been promulgated for soil and debris waste. (These standards require the leachate from treated soils to be less than 1 ppb). Therefore, EPA believes that the LDR standards for dioxin are relevant and appropriate for this site.

EPA is undertaking an LDR rulemaking that will specifically apply to soil and debris. Until that rulemaking is completed, the CERCLA program will not consider LDR to be relevant and appropriate (except for dioxin) to soil and debris that does not contain RCRA restricted wastes.

Following compliance with the LDR treatment levels for dioxin, the solidified soils would be redeposited back on-site in the same unit of contamination from which they originated. The area would then be covered (the cover material would have a permeability less than or equal to the permeability of the natural subsoils) and monitored consistent with the technical requirements for RCRA Subtitle C closure and post-closure (i.e., 40 CFR § 264.310). Under this approach, a double liner/leachate collection system would not be required since; the hot-spot soils would have been removed during closure for the purpose of treating them to enhance the effectiveness of the closure; and RCRA minimum (design and operating) technology requirements (i.e., double liner/leachate collection system) would not be triggered since a new unit is not being constructed nor is replacement or lateral expansion of the existing unit occuring. A groundwater monitoring program would also be established for this remedy in accordance with RCRA regulations 40 CFR Part 264, Subpart F.

Since the solidified soil will remain on-site, the remedy will be reviewed at least every five years consistent with CERCLA Section 121 requirements, to ensure that human health and the environment continue to be protected.

Solidification of the hot-spot soils will meet the greater than 1 ppb level of concern established for dioxin in soils at this site.

Surface water and groundwater are not contaminated at levels exceeding the CRDLs and ARARs for some compounds. For other compounds, however, the CRDLs exceeded either ARARs or other guidance values considered. Consequently, additional sampling of the groundwater was recently performed. The analysis of these samples (with the lowest achievable levels of detection) will determine whether groundwater ARARs and other criteria considered are being exceeded.

EPA believes that soils solidification is an available and reliable technology for the treatment of wastes types identified at the 93rd Street School site. The treatability study would ensure the site-specific technical feasibility and operational reliability of the solidification process.

The selected remedy is cost-effective since solidification of the soils provides comparable effectiveness as the other treatment options, but at a lower cost.

The selected remedy will satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principal element. This will be accomplished through solidification, which is expected to permanently immobilize the soils and eliminate any potential for leaching of both organic and inorganic contaminants. Solidification will achieve protection through a reduction of the inherent hazard posed by the contaminants in addition to controlling exposure to residuals. The remedy will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

To summarize, EPA and DEC believe that their selection of on-site solidification/stabilization of the hot-spot soils (Alternative 4), will satisfy the statutory requirements of providing protection of human health and the environment, will attain all ARARs, and is cost-effective. Since this option utilizes solidification to eliminate the principal threat at the site, this alternative would also satisfy CERCLA preference for remedies which employ treatment as their principal element to reduce toxicity, mobility or volume of the contaminants at the site.

"Attachment A"

"Administrative Record Index
not included."

ATTACHMENT B

M. Howe

New York Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

Mr. Stephen D. Luftig
Director, Emergency and Remedial
Response Division
United States Environmental
Protection Agency
Region II
26 Federal Plaza
New York, New York 10278

Dear Mr., Luftig:

Re: 93rd Street School Site, Niagara Falls, Niagara County, Remedial Investigation/Feasibility Study, Site No. 9-32-078

The New York State Department of Environmental Conservation (NYSDEC) has recently completed a Remedial Investigation/Feasibility Study (RI/FS) at the 93rd Street School Site, Niagara Falls, Niagara County, New York.

The RI/FS work recommended that the following remedial measures be implemented at this site: 1) Excavate and treat the hot spot soils. 2) Install a low permeability cover over the hot spot soils and extended areas with lower contaminated soils. 3) Monitoring of site. The NYSDEC endorses these recommendations.

Since this site is a Federal Superfund site, it is NYSDEC's understanding that: 1) One hundred percent of the remedial design costs for this project will be eligible for federal funding. 2) the remedial costs will be divided 90% federal and 10% non-federal and; 3) that the operation and maintenance costs for this project will be eligible for federal funding for at least one year following construction completion. After this period of time, the State of New York will be responsible for assuring the operation and maintenance of the implemented remedies.

If you have any questions or comments regarding this matter, please contact Mr. Robert W. Schick or Mr. Amarinderjit S. Nagi, of my staff, at (518) 457-4343.

Sincerely,

Michael J. O'Toole, Jr., P.E.
Acting Director
Division of Hazardous Waste Remediation

AN/tv
cc: G. Pavlou, USEPA-Reg.II
J. Singerman, USEPA-Reg.II
R. Howe, USEPA-Reg. II
J. Loureiro, LEA

ATTACHMENT C

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
93rd STREET SCHOOL SITE

City of Niagara Falls, New York
Site No. 9-32-078

RESPONSIVENESS SUMMARY

Prepared By:

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 WOLF ROAD, ALBANY, NEW YORK 12233
Thomas C. Jorling, COMMISSIONER

DIVISION OF HAZARDOUS WASTE REMEDIATION
Michael J. O'Toole Jr., P.E. ACTING DIRECTOR

JULY 1988

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A transcript of the Public Meeting held on April 13, 1988 is available at the following locations.

New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation
Room 222
50 Wolf Road
Albany, New York 12233-7010

New York State Department of Environmental Conservation
Public Information Office
9820 Colvin Blvd.
Niagara Falls, New York 14304

United States Environmental Protection Agency
Emergency and Remedial Response Division
Region II
26 Federal Plaza
Room 747
New York, New York 10278

Section 1

INTRODUCTION

INTRODUCTION

This report summarizes the public comments and the responses relative to the Remedial Investigation/Feasibility Study (RI/FS) for the 93rd Street School site in Niagara Falls, New York. This RI/FS was performed by Loureiro Engineering Associates under contract with the New York State Department of Environmental Conservation (NYSDEC). The purpose of this RI/FS was to evaluate the nature and extent of site problems, identify and evaluate potential remedial actions which could be implemented to mitigate these problems, recommend an alternative and conceptually design the recommended alternative.

During the remedial investigation, information was obtained on site background and history, site features, hazardous substances present, hydrogeology, groundwater and surface water contamination, and a public health and environmental risk assessment was conducted. Based on the information obtained during this investigation, it was concluded that the groundwater and surface water at the site are not contaminated, above the Contract Required Detection Limits (CRDL) as well is health based standards for many compounds. For some compounds, however, the CRDLs used during RI exceeded both the New York State and USEPA drinking water standards. In addition some compounds exceeded guidance values and criteria considered. Additional sampling of these wells was conducted during the end of May 1988 to confirm that groundwater ARARs are not being exceeded.

Analysis of soils indicated that they are contaminated in varying degrees with heavy metals, volatile organics, base/neutral/acid extractable organics and alpha and beta BHC's. Approximately 3,000 cubic yards (cyd) of fill material was reported to have been brought to the site in 1954 from the 99th Street School site located adjacent to Love Canal. The fill consists of fly ash and possibly pesticide cake, used to regrade a swale located in the school yard. Although dioxin was not detected during this investigation, it was detected previously by others in three isolated surface soil samples and in one soil sample at a depth of 4 to 6 feet at concentrations ranging from 0.11 to 2.3 parts per billion (ppb).

A risk assessment was also performed for the site and it was concluded that significant risks are posed by the site in its unremediated condition primarily due of the presence of Arsenic, Polynuclear Aromatic Hydrocarbons (PAH) and 2.3.7.8 Tetrachlorodibenzo p-dioxin (Dioxin). As a result of this risk assessment, a hot spot area containing about 7,500 cyd of soil was identified at the site where Arsenic, PAHs and Dioxin are present at significantly higher levels than identified in other contaminated soils at the site.

Remedial action alternatives for addressing the potential exposure pathways were developed during the feasibility study including a no action alternative, two containment alternatives (i.e. on-site low permeability cover and off-site RCRA landfill disposal of hot spot soils followed by placement of a low permeability cover) and three treatment alternatives (stabilization/solidification, on-site thermal treatment, and thermal treatment at Love Canal). Each of these treatment alternatives involved treatment of hot spot soils, followed by placement of a low permeability cover over all identified contaminated soils at the site. The final alternatives were evaluated on the basis of the following criteria:

- Protection of Human Health and the Environment
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
- Reduction of Toxicity, Mobility or Volume
- Short-Term Effectiveness
- Long-Term Effectiveness and Permanence
- Implementability
- Costs
- Community Acceptance
- State Acceptance

Based on this evaluation, the alternative involving the treatment of soils by solidification/stabilization was chosen as the preferred alternative. The NYSDEC and the United States Environmental Protection Agency (USEPA) hold a Public Meeting on April 13, 1988 at the Frontier Volunteer Fire Hall in the Town of Wheatfield, New York to obtain public comments on the preferred alternative for remediation of the site. A verbatim transcript of the public meeting was recorded as required under Section 117 of Superfund Amendment and Reauthorization Act (SARA) and is available at the NYSDEC Public Information Office in Niagara Falls, NYSDEC Office at 50 Wolf Road, Albany and USEPA Region II office at 26 Federal Plaza, New York City. Three public availability sessions were also held at the NYSDEC Public Information Office, Love Canal, Niagara Falls on April 14, 1988 to provide citizens an opportunity to discuss the project with the project personnel on a one-to-one basis. A public comment period for the submission of written comments was established until May 25, 1988. All public comments received at the Public Meeting and during the comment period are discussed in this Responsiveness Summary. This Responsiveness Summary will be an attachment to the Record of Decision (ROD) which is to be issued by the USEPA.

Copies of these documents and all pertinent project documents are available for public information at the NYSDEC Public Information Office, 9820 Colvin Boulevard, Niagara Falls, New York, telephone (716) 297-9637.

Many concerns were raised during the April 13, 1988 public meeting regarding different components of Love Canal Remedial Program, especially the Black and Bergholtz Creeks Remediation Project. While effort was made to respond to these comments during the public meeting, only the comments relative to 93rd Street School site RI/FS have been addressed in this Responsiveness Summary.

A. SITE HISTORY

Q. There was an old groundwater swale that came from the northwest corner of the Love Canal site and cut across the 93rd Street School site. It went right under the school and then continued across where 93rd Street is now located. It then continued west through the backyards of the homes on Shantz Avenue and emptied into the Bergholtz Creek. The swale was filled in and we have a manhole back there. I think the contamination could have come from the Love Canal through the swale and through the backyards on Shantz Avenue. Why wasn't the swale ever sampled on Shantz Avenue? Why wasn't a sample ever collected from that manhole?

A. From the Board of Education records of the construction and pre-construction periods, it has been determined that a drainage swale crossed the site from southeast to the northwest and discharged into the Bergholtz Creek. The soil borings and analysis showed reduced quantities of fill and low levels of contamination on the western side of the school building near 93rd Street. The present study, however, concentrated on the 93rd Street School site between Bergholtz Creek on north, Colvin Boulevard on south, 93rd Street on west and residential properties on east.

Q. How do you know the contaminated soil came from the Love Canal?

A. During January 1954, the Niagara Falls Board of Education (NFBE) authorized the hiring of a contractor to the transfer soils from the 99th Street School, adjacent to the Love Canal landfill, to the 93rd Street School to be used as fill for low spots at the site. However, whether this soil was contaminated is not documented.

Q. When you sampled for dioxin what was the size of the grid you used to decide where your samples would be collected?

A. During the soil sampling effort in 1985, NUS Corporation under contract to the USEPA, utilized two grids one on 80 ft. centers and the other on 10 ft. centers. These sampling locations are shown on drawing S-2 of the RI/FS report.

Q. When was the 93rd Street School put into the Love Canal Emergency Declaration Area (EDA)?

A. The 93rd Street School was located inside the boundaries of the Love Canal Emergency Declaration Area when it was established in 1980.

Q. Did anybody sample the bedrock? How deep is the bedrock?

A. The bedrock goundwater was not sampled nor were any bedrock monitoring wells installed under this Remedial Investigation. However, during past investigations, (Engineering Investigations Phase II by RECRA Research, Inc. in 1984) bedrock groundwater was sampled and found to be within acceptable limits. The depth to bedrock was found to be about 25-27 feet.

B. SITE CONTAMINATION/INVESTIGATION

Q. How many cubic yards of contaminated soil do you have?

A. As a result of the studies completed during the RI/FS, it is estimated that a maximum of 7,500 cubic yards of contaminated material requiring treatment are at the 93rd Street School site.

Q. Did you find dioxin at the site?

Did others find dioxin at the site? If so, how much? How far down in the soil was it?

A. During the remedial investigation, dioxin was not found in soil or groundwater samples. Dioxin was detected in soil during previous studies performed by others. These locations are indicated on maps in the RI/FS report and are summarized as follows:

- Recra Research, Inc. found dioxin during the Phase II Investigations in one soil sample taken during the installation of monitoring well No. 4 at a depth of 4-6 feet. The concentration of dioxin in this sample was 2.3 ppb.

- During investigations by NUS Corporation, three out of 60 soil samples showed the presence of dioxin at concentrations of 1.2, 0.11 and 0.19 ppb.

These locations are included within the hot spot area to be remediated (treated) as part of this project.

Q. What contaminants are actually present at the 93rd Street School Site?

Is the chemistry of the 93rd Street School site similar to the Love Canal wastes?

A. Some of the chemicals detected in the 93rd Street School Site soils are reported to have been deposited in Love Canal and are also found in the Love Canal Leachate Treatment Facility influent. These include antimony, arsenic, cobalt, copper, methylene chloride, chloroform, 1,1,2-2, tetra chloroethane, toluene, ethylbenzene, 1-4 dichlorobenzene, naphthalene, fluoranthene, pyrene, bis(2-etylhexyl phthalate) and alpha BHC.

Q. Why did other people find dioxin and you didn't?

Why didn't you sample for dioxin in the same area where the others found dioxin before?

A. Areas at the 93rd Street School Site which were sampled during previous studies (including the creek banks, surface soils, and soils in the vicinity of some existing monitoring wells) were not resampled during the remedial investigation for the following reasons:

- the findings of the previous studies were considered to be accurate
- application of the sampling and analysis in the areas described above was considered unnecessary

In the areas which were sampled during the Remedial Investigation, dioxin was not detected. Since these samples were collected from locations not sampled previously, the results are not considered to be contradictory.

Q. What makes you think the dirt from the 99th Street School was contaminated? Where did the idea that it was contaminated come from?

The dirt brought from the 99th Street School was placed on top of the flyash. That's why your sample shows your chemicals are four feet below the ground surface because that was clean dirt from the 99th Street School that had nothing to do with contaminants.

A. There is no record of this material having been tested before being used as fill at the 93rd Street School Site. Therefore, it is difficult to say with confidence whether the material brought from Love Canal was or was not contaminated.

Q. How dangerous is dioxin to humans? How many people died from it?

How far from dioxin should humans be?

A. Dioxin is considered to be a toxic substance and is a suspected carcinogen. It's effects include gastric ulcers, spleen and kidney damage, respiratory tract and nervous system damage and teratogenicity. No reported deaths can be directly attributed to dioxin exposure.

Q. If this area is contaminated, why isn't it fenced off?

A. The remedial investigation report, as well as reports on investigations conducted in the past, were reviewed by the New York State Department of Health (NYSDOH). It was considered that the present situation did not warrant fencing the site to restrict public access. During remediation of the site, work areas will be fenced to restrict access to machinery and exposed soils.

Q. How large is the contaminated area at the site?

A. The hot spot area proposed for excavation encompasses approximately 3.5 acres.

Q. Are there radiation hot spots in the 93rd Street School site area. Is there any documentation about this?

A. The available data and reports do not indicate the presence of any radioactive hot spots. NYSDOH during a sampling effort in 1979-80 concluded that no significant levels of beryllium were present in the 511 samples collected from site. No readiation sampling was performed as part of the study.

Q. Could any contamination from the 93rd Street School site be entering the sewer System on 93rd Street? They are always pumping on the corner of Colvin Boulevard and 93rd Street.

A. The present investigation did not indicate any connection of the site to the sewer system. The site drainage presently is provided by the gentle slope towards the swale which runs across the middle of the site and discharges to the Bergholtz Creek.

Q. If you find contaminated groundwater at the site, you'll have to pick a remedy: what if the contaminated groundwater remedy interferes with the contaminated soils remedy?

A. Existing data from wells on the site do not indicate any significant groundwater contamination problem; however, if unacceptable levels of groundwater contamination are found, adjustments to the proposed solidification/stabilization alternative may be required. It is not anticipated, however, that adjustments will be necessary. If any groundwater remediation technologies are required, they will be carefully selected and this remediation will be the subject of a subsequent Record of Decision (ROD).

Q. Which are the upgradient and downgradient monitoring wells? Why weren't you sure which type of well they were?

A. The monitoring wells where the groundwater level is at a higher elevation are called upgradient wells while the wells with a lower groundwater level are called downgradient. These terms are used to depict the flow of groundwater and in establishing the groundwater contours. Monitoring of groundwater levels over time and evaluating the data will further confirm which wells are upgradient and which are downgradient at the site. Before the wells are installed, designation as upgradient or downgradient is based on site features, previous investigations and nearby water bodies.

Q. <u>Once you resample the groundwater monitoring wells and analyze the data will you extend the public comment period if you find anything?</u>

A. We do not intend to extend the comment period for the RI/FS to wait for the analytical results, since they are intended as confirmatory. If, however, problems requiring remediation of the groundwater are discovered a ROD detailing any remedial actions needed to address the problems, with all attendant community participation, will be prepared.

Q. <u>Why don’t you collect your additional groundwater data before you select a remedy?</u>

A. Previous groundwater sampling did not detect contaminatnts in the groundwater, however, the detection limits for certain compounds did not allow confirmation that groundwater standards for these compounds were not being exceeded. This round of sampling will allow such a determination to be made. Since a problem is not anticipated, it was decided not to delay remedial design at this time. The groundwater samples from the monitoring wells at the 93rd Street School site were collected during the last week of May 1988 and sent for analysis. The data from the laboratory is expected to be available for the engineering consultant during the remedial design phase of the project.

Q. <u>Are you going to retest the monitoring wells?</u>

A. The monitoring wells have already been retested. Groundwater samples were collected from the 13 monitoring wells at the 93rd Street School site during the week of May 23, 1988 and sent to the laboratory for analysis.

C. REMEDIAL ALTERNATIVES

Q. Why don’t you excavate the contaminated soil and take it to a hazardous waste landfill? That would be a permanent solution.

A. An alternative to dispose of the 93rd Street School Site soils at an approved off-site facility was evaluated during the Remedial Investigation and Feasibility Study and was found to be unimplementable due to the difficulty of finding a facility that will accept waste from the Love Canal Emergency Declaration Area (EDA) and meeting RCRA Land Ban Requirements. In addition, the treatment of wastes as opposed to their containment is a preferred alternative. Landfilling of untreated waste is not considered a permanent solution.

Q. Could we use the same incinerator being used for treating the creek sediments to destroy the 93rd Street School site contaminants even though there are heavy metals at this site?

A. An alternative to treat the 93rd Street School site soils using the proposed thermal treatment unit at Love Canal has been evaluated in the RI/FS Report. This alternative was determined to be less effective than the alternative involving treatment of soils by solidification/stabilization due to possible difficulties in thermally treating the metals.

Q. Why don’t you build an interim containment facility at the Love Canal site for the contaminated soil at the 93rd Street School site? You could still solidify these materials later.

A. Construction of a separate storage facility at the Love Canal site for temporary storage of soils from the 93rd Street School site was not considered for the following reasons:

– it is impractical to transport the soils to Love Canal if the soils are to be stabilized/solidified at the 93rd Street School site.

S if the contaminated soils from the 93rd Street School site are to be treated using the proposed transportable thermal unit at the Love Canal site, it will be more economical to temporarily store the soils from the 93rd Street School site at the Dewatering Containment Facility to be built under the contract for the Black and Bergholtz Creeks remediation.

Q. OCC proposed storing wastes in bags for years. Have you considered this option?

A. NYSDEC does not consider storage of waste in plastic bags, as proposed by OCC, as a permanent solution to remediation of a site.

Q. Is incineration feasible if you have metals present?

A. Yes. However, the presence of metals may require additional handling and/or disposal requirements, as well as the need for special operating conditions during the operations of thermal process. Treatment of 93rd Street School Site soils containing metals using a thermal treatment unit was considered and fully evaluated in the feasibility study report.

D. <u>PREFERRED ALTERNATIVE/REMEDIATION</u>

Q. <u>When you place the soil cover on the site you'll chance the elevation of the ground in that area. Water running off the site will flow towards the creek and towards Colvin Boulevard and 93rd Street. Did you take any flood control measures? Will Colvin Boulevard and 93rd Street be able to handle the runoff from the site?</u>

A. During Remedial Design, the Engineer will be required to address issues such as providing adequate surface drainage and flood control measures. Runoff to 93rd Street and Colvin Boulevard will be calculated, and the existing drainage system will be analyzed to determine if it has adequate capacity or must be modified to accommodate this flow.

Q. <u>As an additional precautionary measure, why don't you place a 40 or 60 mil liner over the area that's being covered or at least over the hot spots? Clay isn't as impermeable as people think.</u>

A. The Remedial Design Engineer will consider the feasibility of using different materials, including clay and/or a synthetic liner as cover for the site.

Q. <u>Will the solidified soil be properly compacted when it is replaced so that you don't create voids and possibly trap water in that area? When will you decide whether the solidified material will be a brick, a slab or some other form? Will the public know about it before it is done?</u>

A. The consistency and form of the final product after the treatment of soil at the 93rd Street School site is technology/vendor dependent. The vendor will be required to ensure that significant voids are not created and backfilling is done per the requirements specified in the contract. More data on the particular vendor and the process will be made available for public information as it becomes available during the remedial design and construction stages of the project.

Q. <u>Are you going to monitor this project after you solidify this material? If so, for how long</u>?

<u>What kind of monitoring program will this be?</u>

A. Following implementation of the solidification/stabilization alternative, the site will be monitored. The details of the monitoring program will be developed during the remedial design phase of the project. It is anticipated that monitoring will include periodic groundwater sampling, site inspections and detailed site evaluations. This monitoring program will be subject to public review and comment.

Q. How were you able to select a remedy without having all the groundwater data available?

A. No contamination above the contract required detection limits (CRDL) as well as the health based standards for some compounds has been detected in groundwater during these investigations. For other compounds, however, the CRDLs used during RI exceeded the drinking water standards, guidance values and criteria considered. Consequently sampling with the low detection limits of the groundwater was again conducted during May 1988 to determine whether groundwater ARARs are being exceeded. This resampling of groundwater is to satisfy the requirements of the Superfund Amendment and Reauthorization Act (SARA). If unacceptable levels of contamination are detected in the groundwater, adjustments to the treatment technology (solidification/stabilization) could be required during the design phase, however, no major adjustments are anticipated. If groundwater remediation becomes necessary, it will be addressed in a subsequent ROD.

Q. How deep will you excavate?

A. The hot spot soils were determined to be up to 6 feet in depth. For the purposes of the RI/FS report, it was estimated that the depth of the proposed solidification/stabilization treatment will extend to at least one foot below the depths of the hot spot soils. Therefore, unless changes are deemed necessary during the remedial design, hot spot soils will be solidified/stabilized to a maximum depth of seven feet.

Q. On your map you show some dioxin hot spots along the creek bank. Is that a part of the creek cleanup or will that be cleaned up under the 93rd Street School site cleanup program?

A. The remediation of the Bergholtz and Black Creek beds and banks is covered under the Creek Remediation Project which is underway. The 93rd Street School site does not include the creek banks. Any dioxin above one ppb outside the limits of excavation of the creeks will be handled under the 93rd Street School Remediation.

Q. Why don’t you use a better soil type such as clay as a cover?

A. The selection of the type of soil cover, its thickness, slopes, etc. is part of the remedial design for the 93rd Street School site. The remedial design for this project is expected to begin in late fall of 1988. The remedial design will be subject to public review and comment.

Q. How much soil will be placed over the solidified materials?

A. The actual depth of soil to be placed over the site will be determined during the remedial design stage of this project however, it will be a minimum of one foot in depth. The remedial design for this project will be subject to public review and comment.

Q. Will any trees be cut down during the 93rd Street School remediation?

A. No trees are expected to be cut under the 93rd Street School site remediation project. The trees along the Bergholtz Creek banks may be cut down as part of the remediation of the Creeks.

Q. When you complete your treatment of the soil and put it all back, could I build a house there? Would the land be safe enough for anybody to build a house on?

A. Although the remediation of the site will immobilize the contamination present at the site and limit contact with the treated soil, land use restrictions may still be applicable to prevent or control excavation at the site. The specific details of any restrictions to be imposed will depend on the selected solidification/stabilization process. Land use restrictions will consider the physical properties of the treated soil which may limit building on the property, as well as other factors such as the final design of the cover.

Q. Once the work gets started, how long will it take to complete?

When will you start the actual cleanup project?

A. The time to complete remediation of the site by way of the solidification/stabilization technology is expected to be approximately 36 months from the signing of the Record of Decision (ROD) for the 93rd Street School site. Delays in the creek remediation project will negatively affect this estimate. Construction will not begin until the completion of the Creek remediation project, which means the solidification/stabilization is expected to begin during the 1990 construction season and should be completed in one construction season. The detailed schedule will be worked out during the remedial design phase of the project.

Q. Will the 93rd Street School site remediation be done before the Black and Bergholtz Creek cleanup is done?

A. Due to the fact that part of the 93rd Street School site is being used as staging and access for the creek remediation project, it will not be possible to implement the remediation at 93rd Street School site until after the creek remediation is completed. The creek remediation is scheduled for completion by end of 1989.

Q. Will it be safe to walk across the area when this is done?

A. Yes. It will be safe to walk across the site once the remedy is in place.

Q. <u>If I walk across a dioxin-contaminated spot right now will I have any ill-effects from walking across it?</u>

A. Based on the data available for the site it is unlikely that walking across the site would pose a significant threat to human health.

E. SOLIDIFICATION

Q. Is solidification considered a permanent remedy?

Is chemical fixation a permanent solution? I've been told contaminants will dissolve out.

How long will the contaminants stay fixed after they've been treated?

A. The literature from the various firms working on stabilization and solidification technologies indicates that the technologies are capable of locking contaminants both physically and chemically into an unreactive product. This is accomplished by use of chemical additives such as silicates, setting agents, etc. which chemically react with contaminants. Once treated the contaminants should remain immobilized even if the treated material physically breaks down. During the Oremedial design phase, the stabilization or solidification contractors will be required to demonstrate that their technologies are capable of effectively treating the soils from the 93rd Street School site through bench scale and/or pilot scale tests.

Q. Has this treatment ever been used any place else?

A. Various companies dealing with solidification and stabilization such as Hazcon, Soliditech and Chemfix have been in this business for several years and have treated industrial wastes containing heavy metals and/or complex organics for different industries including Amoco Oil, Monsanto, Mobil Chemical and Atlantic Richfield at various locations across the U.S. This technology has also been recently utilized as part of a remedial clean up at other CERCLA sites (eg, Peppers Steel and Alloys site, Florida). Futher solidification/stabilization technology has been demonstrated as part of the USEPA Site Program, and has been selected as a remedy for other CERCLA sites.

Q. Is this just an experiment?

A. Since solidification and stabilization technologies have been used in the past for treating different industrial wastes, it is not considered an experimental technology.

Q. Do you know if solidification will work?

A. The literature on these technologies indicates that solidification/stabilization technologies can be used effectively to treat the soils at the 93rd Street School site. However, during the remedial design phase, the contractors will be required to demonstrate through bench and/or pilot scale testing that their solidification/stabilization processes are capable of effectively treating the soils at the 93rd Street School site. Information about this technology has been provided in the RI/FS report and in hand outs made available by NYSDEC during and after the Public Meeting.

Q. <u>Can citizens receive information on the different solidification processes?</u>

A. Copies of literature on different solidification/stabilization techniques being considered for the 93rd Street School site are available at the New York State Department of Environmental Conservation, Public Information Office, 9820 Colvin Boulevard, Niagara Falls, New York, telephone (716) 297-9637.

Q. <u>How can citizens comment on these solidification processes if they do not have enough information to tell them if it works?</u>

A. Literature on the different solidification/stabilization techniques has been available at the NYSDEC Public Information Office, 9820 Colvin Boulevard, Niagara Falls, New York since April 13, 1988. In addition, once a solidification/stabilization process is selected and pilot data (testing data) is generated, this information will be made available to the public.

Q. <u>When you replace the solidified contaminants, how far down will it be buried?</u>

A. It is anticipated that the depths to which the solidified/stabilized soils will be placed will correspond to the proposed depths of the excavated hot spot area. Since the selected solidification/stabilization technology will be capable of immobilizing permanently the contaminants in the hot spot soil, the treated soils will be placed in the same area from which they were excavated. As an added precaution, a low permeability cover will be placed over the treated soils.

Q. <u>Will solidification completely remove the potential hazards from the entire contaminated area?</u>

A. The treatment of contaminated hot spot soils by way of solidification/stabilization is intended to immobilize permanently the contaminants. The hot spot area and the remaining area with lower levels of contamination will be covered with a low permeability cover. This will decrease the potential hazard from the area to what is considered an “acceptable” risk level.

Q. <u>What is the stabilization/solidification process? What type of equipment does it use to treat the contaminated materials?</u>

A. Specific procedures and equipment used for each stabilization/solidification process differ. In general, the basic procedure will be similar to that described below:

- excavation of soils
- feed soil into enclosed mixers along with process additives

- treat the soil (may involve mixing, heating, drying, etc.)
- sample and analyze the treated soil
- retreat any materials not meeting requirements for disposal criteria
- backfill the excavated area with acceptably treated material
- monitor the air for volatile organic chemical and dust emissions
- monitor the soil for leaching
- monitor the groundwater for leaching

F. PUBLIC PARTICIPATION

Q. Can we look at the remedial plan?

A. Yes. All reports, analytical data and evaluations of various remedial alternatives relative to this project including the remedial plan, are available for public reference at the NYSDEC Public Information Office, 9820 Colvin Blvd., Niagara Falls. The office is open Monday thru Friday, 8:30 a.m. - 4:30 p.m.

Q. If solidification is selected as the site remedy, will there be other public meetings during the preliminary design so that we can take part in adding to it?

A. Yes. Additional opportunities for public input will be provided as the project proceeds into and through design.

Q. You seem to have made up your mind about how you will remediate the site. You should wait to make any final decisions until you take the public's comments into consideration, otherwise we're just going through the motions of having Citizen Participation.

A. The public comments received within the comment period will be considered, the proposed alternative will be reevaluated taking the comments received into consideration, and the comments will be responded to in a Responsiveness Summary before any decision as to remedy is finalized. USEPA/NYSDEC are required by section 117(a)(1) of SARA to present the proposed alternative to the public for their comments.

G. MISCELLANEOUS

Q. Are you going to post signs to warn the children?

A. Signs will be posted and work areas will be temporarily fenced to restrict access during remediation of the site.

Q. How will this 93rd Street School site project affect the habitability study, the health study or the land use of the area around the site?

A. Remediation of the 93rd Street School site is not one of the criteria established in the habitability study document. However, the remediation of the 93rd Street School site is expected to have a positive impact on revitalization of the area.

Q. Problems with reading the maps in the handouts and in the report.

A. The copies of maps enclosed in the handouts distributed at the April 13, 1988 public meeting were obtained by reducing the full size drawings to 8 ½" x 11" sheets. During the process of reduction some of the maps became difficult to read. However, the full size drawings were displayed at the public meeting and they are available at the NYSDEC Public Information Office for reference.

Q. May 6 was long enough for a comment period for this project. Why was it extended to May 25?

A. The public comment period was extended to May 25, 1988 to satisfy the federal requirement that the administrative record be available to the public for 21 days.

Q. There’s a supplement with some missing data that you had to get. Where is that data?

A. The RI/FS report consists of the following volumes:

- Volume I - Remedial Investigations
- Volume I - Appendices
- Volume II - Feasibility Study
- Volumes III & IV - Supplemental data (which the question refers to)

All five bound volumes have been available at the NYSDEC Public Information Office for your review since March 1988.

Q. <u>I thought the Superfund was there so the government could take immediate corrective action to try to stop further contamination problems until a permanent remedy could be done. Under Superfund what do you mean by permanent cleanup?</u>

A. Under federal Superfund, an immediate corrective action called an Expedited Response Action (ERA) could be initiated if justified for a particular site. The contamination at 93rd Street School site did not warrant such an action. Under the new Superfund Amendment and Reauthorization Act (SARA) reduction of toxicity, mobility or volume of waste is considered to be a permanent cleanup. The stabilization/solidification process, which reduces toxicity and mobility of the waste is considered to be a permanent solution.

Q. <u>Why has this site been studied so many times? Why wasn’t it studied once and then get on with the cleanup?</u>

A. Phase I and Phase II investigations at the 93rd Street School site provided preliminary data upon which a full scale investigation could be designed. The RI study is a much more detailed and involved investigation which provides sufficient information to evaluate alternatives for remediation of the site. Additional sampling/data collection may occur during design to further define the area to be remediated. Each investigation builds on the previously gathered data.

Q. <u>Why is it taking so long to get this site cleaned up? With proper engineering, design and foresight a number of these activities, like cleanup of the creeks and cleanup of the 93rd Street School site, could have taken place concurrently?</u>

A. The 93rd Street School site and Creeks remediation are two separate components of the overall Love Canal remedial program. At the time the creek remediation project was in the remedial design, the School site was in the RI/FS stage. In order to combine these projects, the work on the creeks would have to be delayed until the school project caught up. Delaying the work on one project to make it occur concurrently with another project did not seem justified, especially since clean up of the creeks was a condition of rehabilitation of the EDA, as per the Habitability Study criteria.

Q. <u>Why wasn’t the remediation of the EDA looked at as a whole? That would have saved us a lot of time in revitalizing the EDA.</u>

A. The Love Canal site is one of the most complicated sites in the country. Extensive investigation and engineering studies were required to develop a remedial program. In the beginning, the EDA was looked at as a whole and various sub-units were developed in order to create workable components. This allowed the project to proceed in phases, and the most immediate needs were addressed first. Looking at the EDA as a whole would have further delayed the work all this site.

Section III

Response to Written Comments

Response to Niagara County
Health Department's Comments

NIAGARA COUNTY
HEALTH DEPARTMENT
HUMAN RESOURCES BUILDING
MAIN POST OFFICE BOX 428
10th AND EAST FALLS STREET
NIAGARA FALLS, NEW YORK 14302

April 26, 1988

Mr. Amarinderjit S. Nagi, P.E.
New York State Department of
Environmental Conservation
Room 222
50 Wolf Road
Albany, New York 12233-7010

Re: RI/FS Report
93 rd Street School Site

Dear Mr. Nagi:

Please consider this letter to be formal comment on the above captioned report to be included in the official record.

This Department has reviewed the RI/FS report for the 93 rd Street School site. Based on the data provided in the RI/FS report and various other information available to this department from nearby areas, we feel that the severity of contamination present at this site has been over estimated. By our interpretation, the site conditions found are typical of the prevailing ambient conditions present throughout the Niagara Falls area. In other words the contaminant concentration found at this site are are essentially the general background conditions present throughout the Niagra Falls area do not appear to be substantially elevated by any site specific condition.

We do not feel that contaminant concentrations found at the site constitute any substantial risk to health or the environment above those which exist throughout the Niagra Falls area. Therefore we feel that site specific remedial action, including those recommended by the consultant would have little or no real effect in reducing risks associated with this site. We strongly feel that the recommended remedial actions are excessive and can not be justified.

Discussion of specific details of the report follows:

1) Adequacy of the data base: While it may be necessary to resample certain wells to obtain adequately low detection limits to meet statutory and regulatory requirements, we feel that the data base provided is adequate to reasonably estimate the extent and severity of contamination on site, to assess possible exposure attributable to the site and to evaluate conceptual remedial actions. Some additional characterization of the areas of possible dioxin contamination may be appropriate to better focus on the precise extent of any dioxin contamination in order to finalize a remedial design. The soil/waste sample data base is adequate to provide a reasonable degree of statistical confidence in the data.

2) Historical data: While the historical data presented in the RI report appears to be accurate, several items are noted below which should be added for completeness:

   a) A housing project previously existed on the south portion of the property. It appears that former road beds and foundations are still present beneath the top soil in this area. It is likely that debris from the demolition of these structures may also be present.

      It is noted that a 1979 radiation survey conducted by the NYSDOH found radiation levels somewhat above background in the area of the former project. This radiation is apparently associated with slag material used in the construction of the former roadways. While this material appears to be of little concern in its present location, some precautions may be appropriate if it is necessary to excavate this material. Several documents regarding the previous radiation surveys are attached.

   b) In 1979, suspected waste material was excavated from the ball diamond area and was eventually disposed of at CEOS by Walter Kozdranski Trucking Company. It is reported that a foot or more of material was removed (10 to 20 or more tractor trailer loads), a plastic sheet placed and the area backfilled with clean soil. Several documents from our files regarding this action are attached.

   c) We question whether or not any of the material at the school site was actually contaminated by Love Canal chemicals. It is noted that none of the common Love Canal indicator chemicals were found at the 93 rd street site.

3) Evaluation of the extent of waste/fill material: The horizontal and vertical extent of waste/fill material has been adequately defined.

4) Evaluation of the significance of contaminants present on-site: As previously noted, we feel that the consultant has substantially overestimated the significance of the contaminant concentrations present on-site. By our interpretation, the distribution of contaminant concentrations found essentially matches the typical background distributions typical of the general Niagra Falls/Wheatfield area.

This department has complied background profiles for arsenic, chromium, copper, nickel, lead, zinc and mercury in soils in the Niagra Falls area. These profiles were compiled from the results of about 200 data points in eastern Niagra Falls and Wheatfield. The data was screened to remove anomalies and suspicious data, compiled and curves fitted to each distribution. These profiles have previously been used by this department and by the NYSDOH to evaluate the significance of metals contamination at other area sites. We feel that these profiles are adequate for this purpose and are the best available source of background data in the study area.

The above profiles were made available to DEC and were used by the consultant. However, we feel that the method used to compare the on-site data to these background profiles was inappropriate. The consultant essentially compared the individual concentrations of each metal to the average concentration of the receptive background profiles, subsequently labeling an individual concentration as "exceeding background" if it exceeded the average background concentration. This method of comparison is not statistically valid and yields misleading results. The appropriate method of comparison would be to compare the distribution of the background concentrations. We have done this. Using this method it is our interpretation that of the 147 samples analyzed from the site the only results which are outside of the expected background distribution are:

-arsenic at 350ppm in sample 1-P4D
-cadmiumat at 133ppm in sample 1-P4D
-lead at 843ppm in sample 2-P114A
-mercury at 23ppm in sample 1-P1C

The remainder of the metals data is considered to represent only area-wide background. This conclusion is reinforced by noting that the special distribution of metals contamination appears to be random (except for lead which is apparently slightly higher adjacent to the paved driveways and parking lot, possibly suggesting the influence of past runoff containing traces of leaded gasoline.

We have attached computer output which demonstrates our comparison of the arsenic concentration distribution from the 93rd Street to our arsenic background profile. This analysis suggests that only the single result of 350ppm at 1-P4D is outside of the expected distribution. We can demonstrate similar relationships for the other metals if requested.

Based on the above discussion we feel that the metals concentrations found on-site are essentially typical background for the Niagra Falls area with only rarely isolated and apparently unrelated exceptions. Since these isolated exceptions occur only in areas direct contact is not possible (either subsurface or below asphalt pavement), we see little significance in these values and we are not very concerned with them. In addition we note that the values in the ranges of the exceptions (several hundred ppm for arsenic, over 20ppm for mercury, ect.) Have been found at a number of other sites in this county and have not resulted in remedial actions being taken, even when these concentrations were found in surficial samples from accessible areas. We can not justify taking any remedial action based on the metals concentrations found at the Ninety-third Street site.

With regard to the organics data, and pesticides we agree with the consultant that volatile organics do not seem to be of much concern here. We do not agree that PAH compounds are elevated above typical background values in any sample collected at this site. While we have not compiled formal background profiles at this site we have compared the total PAH values at the 93rd Street site to those from other studies in the LaSalle area summary of this comparison is provided below:

93 rd Street School	5% of samples exceed 10ppm (total PAH), maximum value = 76.6ppm average is less than 4ppm
64 th Street-South (1985 NUS data)	37% of samples exceed 10ppm maximum = 173ppm average = 14.7ppm
64 th Street-North (1985 NUS data)	38% exceed 10ppm maximum = 100.6ppm (2 samples exceed 100ppm) average = 25.3
National Fuel Gas Site (NUS data)	25% exceed 10ppm maximum = 63.7ppm
59 th Street (NUS 1985):	33% exceed 10ppm maximum = 16.8 average = 7.08
Niagra Falls Business Farms Site:	50% exceed 10ppm maximum = 63.7ppm

In all of the above cases, PAH concentrations are somewhat higher than at 93rd Street. In each of the above cases NYSDOH and ATSDR concluded that these levels of PAH's were typical of urban areas and that no further actions were justified at these sites based on health risks associated PAH concentrations. We agreed with these evaluations.

Based on the above discussion we can not justify any further remedial action based on PAH concentrations.

With regard to dioxins, we note that there appears to be only one sample of 70 which raises some concern. In our opinion the concern is small however we would consider some followup sampling in the area of that detection to be appropriate to better define the extent of contamination. This should be done prior to selecting a remedial option.

It is noted that none of the typical Love Canal indicator compounds were found at the 93rd Street Site.

5) <u>Evaluation of migration potential:</u> We consider this potential to be small based on the absence of contamination in the perimeter wells and surface water and our understanding of local soils and geology. We do not consider groundwater remedial actions to be necessary.

6) <u>Exposure assessment/Risk assessment:</u> We feel that an incremental assessment should have been performed, that is that inadddition to estimating absolute risk, an estimate of the increased risk over background should also have been provided. Similarly, an estimate of the decrease risk after remediation should have been provided. Based on our estimates the increased risk over background and the decreased risk after remediation are negliable. Based on these estimates we feel that the no action alternative may be feasible and should be considered.

We also feel that the exposure scenarios used to make a number of over-conservative assumptions. The cumulative effect of these assumptions is to greatly overestimate the risk associated with the site. We can elaborate on this if desired.

7) <u>Evaluation of the remedial options:</u> Based on the previous discussion, we feel that the no action alternative is a viable alternative. This alternative should not be eliminated from consideration.

We also question the assumption that any excavated waste material would be a RCRA hazardous waste. We suspect that the waste material found at this site would pass the EP toxicity test and that it would exhibit no other hazardous characteristics. We do not believe that this material would be a listed and would be well below 1ppb. There does not seem to be any "Landfill ban" contaminants present in significant quantities. We feel that the RCRA status of the waste should be determined and if the waste is in fact non-hazardous or even hazardous and landfillable, then the option of excavation and off-site disposal should be reconsidered.

In conclusion, we feel that the potential risks from this site have been overestimated in the RI/FS. We feel that the increased risk over background is negligible. In addition, if it is deemed necessary to remediate the site, the option of excavation and off-site disposal should be reconsidered. We feel that this material could be disposed of in a commercial landfill.

I can provide additional information, documentation or elaboration on any point contained in this letter if requested.

I can be contacted at 716-284-3128.

Sincerely,

Michael E. Hopkins, P.E.
Supr. Public Health Engineer

MEH: lj

Enclosures

cc: J. Devald
J. Tygert
A. Wakeman
L. Rusin

ILLUSTRATIVE EXAMPLE OF METAL DATA COMPARISON METHODOLOGY

In the preceding letter, statements were made which referred to our comparison of metals concentrations in soil at the 93rd Street School site to our Previously compiled background profiles. The following is an example of how we compared these two data sets to reach this conclusion. Arsenic data was selected for this example. A similar procedure can be followed for each metal.

The comparison was aided by the use of a statistical software package (STATGRAPHICS) on a personal computer.

The following steps were followed:

1.) Compile a representative background data set. In this case, we used the data set previously compiled for arsenic concentrations in soil for the Niagara Falls/Wheatfield area. This database was developed for similar use at another area site. Specifically, it was used as a baseline for comparison of soil metals concentrations at Gratwick Park in North Tonawanda (1987) and has subsequently been used at other area sites. We consider this data base to be representative of local background conditions.

2.) In this case it was noted that 33 of the 165 background values for arsenic were reported as below detection limits (typically 5 ppm). In this comparison we adjusted for this using two scenarios. The first was to assume that all values reported as below detection limits were 0 (zero). The second was to assume all such values were at one half the detection limit. We found that in this case the analysis was not very sensitive to which scenario was used. We feel that scenario two is a better estimate of actual background conditions and therefore will use it in this example. The results would be only slightly changed if we would have used scenario one.

3.)The data from the site (combined round one and two data) is plotted as a histogram and examined for obvious outliers. In this case it appears that the single data point of 350 ppm, is an outlier.

4.) The means of the background and sample data are computed and compared. In this case it was found that the mean of the background data (11.25) was approximately equal to the sample mean (14.4) with the outlier excluded. This is considered adequately close for this purpose. Formal statistical tests could be performed to verify this, however it is noted that most commonly used statistical test would not be valid in this case since the distribution is apparently not parametric.

5.) A regression curve is fitted to the background data. Based on numerous trials and past experience, it was found that a gamma curve best fits the data. The curve fitted is then examined for goodness-of-fit. In this case this was done by visual examination, however again formal statistical tests could have been used. In this case the fit is considered adequate.

6.) Using the same type curve as in #5 (gamma) fit a similar curve to the sample data. Again examine the curve for goodness-of-fit. The fit of this curve is also considered adequate.

7.) Plot the density functions representing the curves obtained in #5 and #6 on the same axis. Compare the curve for similarity. In this case we feel the curves are quite similar.

Based on the above analysis we consider the distribution of arsenic concentrations in the soil at the 93rd Street site, to be similar to the background arsenic concentrations with the exception of the single point at 350 ppm which is apparently elevated.

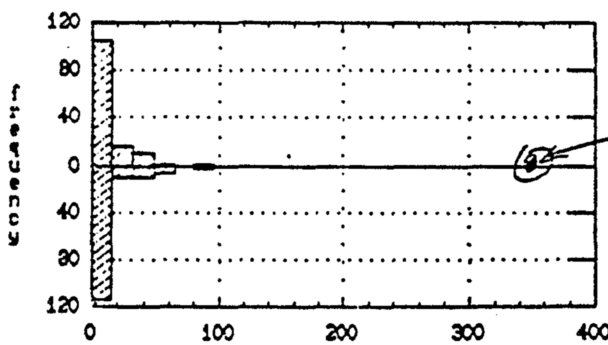
Copies of appropriate computer output are attached for reference.

```
                         Two-Sample Analysis Results

                                               BACKGR      Sample 2    Pooled
Sample Statistics: Number of Obs.              165         147         312
                   Average                     10.7552     16.6986     13.5554
                   Variance                    161.484     1143.85     624.147
                   Std. Deviation              12.7076     33.8209     24.9829
                   Median                      7.2         5.9         6.5

Conf. Interval For Diff. in Means:             95     Percent
 (Equal Vars.)     Sample 1 - Sample 2         -11.52 -0.366969    310 D.F.
 (Unequal Vars.)   Sample 1 - Sample 2         -11.7845 -0.102498  182.5 D.F.

Conf. Interval for Ratio of Variances:         0      Percent
                   Sample 1 + Sample 2

Hypothesis Test for HO: Diff = 0               Computed t statistic = -2.09759
                   vs Alt: NE                  Sig. Level = 0.0367506
               at Alpha = 0.05                 so reject HO.
```

5 reps 2 & 3

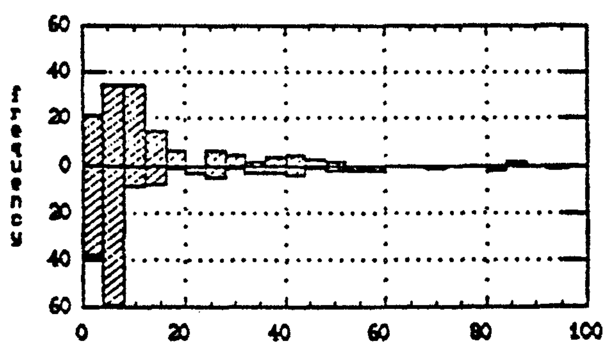
Not valid distributions are not parametric

Frequency Histogram



The point at 350 is an obvious outlier

Frequency Histogram



enlarged scale

Distribution Fitting

ata vector: BACKAD,BACKGR SELECT BACKGR >0

↳ Background using ½ detection limit for "non-detects"

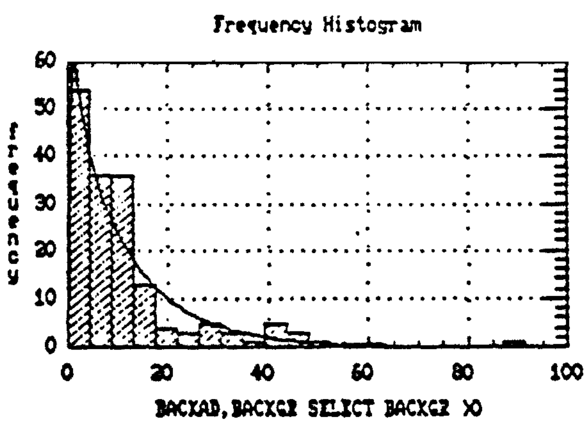
Step 5.

istributions available:

(1) Bernoulli	(7) Beta	(13) Lognormal
(2) Binomial	(8) Chi-square	(14) Normal
(3) Discrete uniform	(9) Erlang	(15) Student's t
(4) Geometric	(10) Exponential	(16) Triangular
(5) Negative binomial	(11) F	(17) Uniform
(6) Poisson	(12) Gamma	(18) Weibull

istribution number: 12

hape (alpha): 0.835226
cale (beta): 0.0742083



Two-Sample Analysis Results

		Sample 1	Sample 2	Pooled
mple Statistics:	Number of Obs.	165	146	311
	Average	11.2552	14.4158	12.7389
	Variance	151.67	380.355	258.982
	Std. Deviation	12.3154	19.5027	16.0929
	Median	7.2	5.85	6.5

nf. Interval For Diff. in Means: 95 Percent
Equal Vars.) Sample 1 - Sample 2 -6.7593 0.438092 309 D.F.
Jnequal Vars.) Sample 1 - Sample 2 -6.85965 0.538448 239.1 D.F.

nf. Interval for Ratio of Variances: 0 Percent
Sample 1 ÷ Sample 2

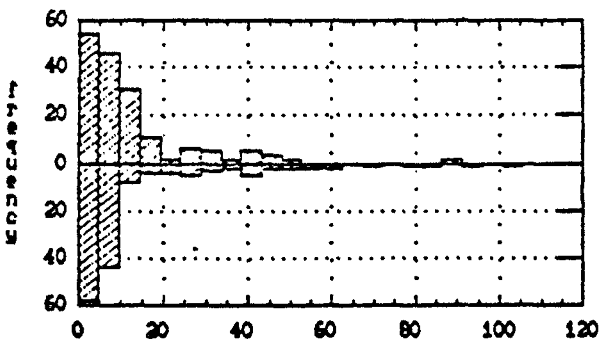
Not valid

pothesis Test for HO: Diff = 0 Computed t statistic = -1.72852
vs Alt: NE Sig. Level = 0.0848947
at Alpha = 0.05 so do not reject HO.

Sample 1 is background adjusted for ND = ~~2 dete~~ ½ detection limit

Sample 2 is 93rd St data excluding 350ppm outlier

Frequency Histogram



Two-Sample Analysis

ample 1: BACKAD, BACKGR SELECT BACKGR>O

ample 2: (NINE3R1 SELECT NINE3R1(350),NINE3R2

BACXAD,BACXGR SELECT BACKGR >0

Distribution Fitting

---

ata vector: NINE3R2,NINE3R1 SELECT NINE3R1 <350

→ round 1 and round 2 data, excluding the 350 ppm outlier

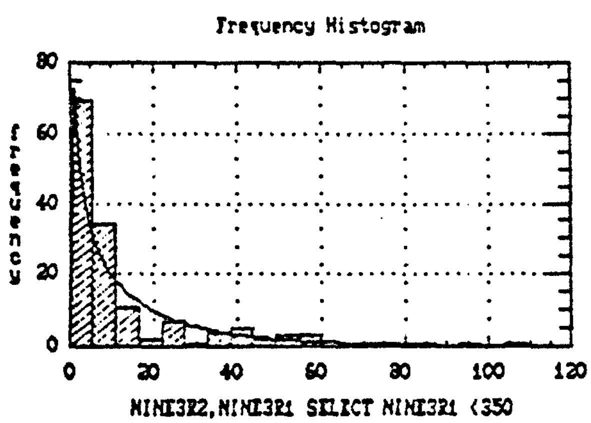
Step 6

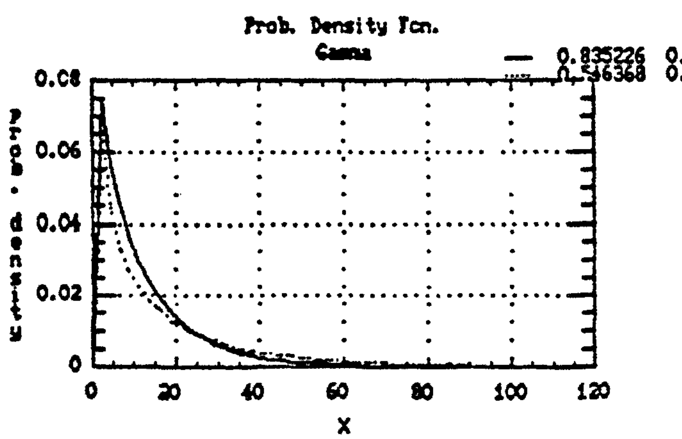
istributions available:

(1) Bernoulli	(7) Beta	(13) Lognormal
(2) Binomial	(8) Chi-square	(14) Normal
(3) Discrete uniform	(9) Erlang	(15) Student's t
(4) Geometric	(10) Exponential	(16) Triangular
(5) Negative binomial	(11) F	(17) Uniform
(6) Poisson	(12) Gamma	(18) Weibull

istribution number: 12

hape (alpha): 0.546368
cale (beta): 0.0379007





(Background) Step 7
(93rd St)

File D:Arsenic 4/23/88

rqw	BACKGR	NINE3R1	NINE3R2
1	25.	3.3	26.0
2	12.	7.0	45.0
3	12.	83.0	5.3
4	0.	5.2	4.9
5	9.	4.1	4.1
6	0.	4.5	6.3
7	6.	15.0	3.8
8	6.	4.4	6.0
9	7.	7.9	3.8
10	0.	8.2	4.0
11	12.	5.3	40.0
12	6.	16.0	6.4
13	7.	26.0	7.1
14	6.	6.6	3.3
15	7.	6.2	7.3
16	0.	2.3	43.0
17	14.	2.1	4.8
18	15.	32.9	5.7
19	7.	350.0	4.4
20	7.	6.3	3.5
21	30.	6.9	31.0
22	7.	6.7	40.0
23	32.	4.7	4.6
24	33.	2.4	7.5
25	28.	2.6	7.2
26	9.	14.0	14.0
27	0.	2.2	3.5
28	10.	3.1	16.0
29	0.	3.9	37.0
30	9.	9.5	11.0
31	13.	4.8	9.0
32	18.	7.8	4.2
33	0.	8.3	3.0
34	0.	5.3	4.8
35	0.	1.8	7.8
36	0.	96.0	7.8
37	6.	105.0	6.2
38	0.	81.0	4.7
39	8.	5.7	3.3
40	0.	4.3	3.5
41	0.	4.5	52.0
42	10.	53.0	26.0
43	6.	7.7	42.0
44	10.	51.0	24.0
45	37.	8.3	6.8
46	0.	6.4	42.0
47	30.	3.5	27.0
48	42.	2.0	34.0
49	17.	2.2	3.9
50	27.	11.0	14.0
51	12.	4.6	59.0
52	19.	2.7	16.0
53	16.	3.8	44.0
	11.	5.8	60.0
	17.	5.1	55.0
	0.	3.9	6.5

BACKGR - Background data vector with non-detects as 0.

Nine3R1 - The Round one soil sampling data from the Ninety Third Street school

Nine3R2 - The round two soil sampling data from The Ninety Third street school

BACKAD - (not shown) is an adjustment to the background to account for non-detects at ½ the detection limit.

Therefore

BACKAD, BACKGR SELECT BACKGR >0 replaces the 0's in BACKGR with 2.5

& Nine3R2, Nine3R1 SELECT NINE3R1 <350 is the combined ~~phase~~ Round 1 and Round 2 data minus the 350ppm value

(see narrative)

File D:Arsenic 4/23/88

rqw	BACKGR	NINE3R1	NINE3R2
58	0.	2.9	26.0
59	25.	71.0	20.0
60	12.	23.0	2.9
61	12.	3.3	14.0
62	0.	5.0	33.0
63	9.	5.9	12.0
64	0.	6.0	3.2
65	0.	4.3	3.9
66	0.	5.0	5.1
67	0.	2.3	4.6
68	0.	4.2	9.9
69	0.	3.1	5.1
70	8.	1.9	4.3
71	10.		3.0
72	10.		3.0
73	7.		4.0
74	0.		4.1
75	7.		4.0
76	12.		5.0
77	15.		5.6
78	20.		
79	14.		
80	10.		
81	10.		
82	13.		
83	18.		
84	12.		
85	7.		
86	0.		
87	0.		
88	14.		
89	10.		
90	0.		
91	16.		
92	15.		
93	12.		
94	11.		
95	13.		
96	25.		
97	49.		
98	13.		
99	88.		
100	8.		
101	31.		
102	44.		
103	28.		
104	14.		
105	10.		
106	40.		
107	15.		
108	10.		
109	6.		
110	0.		
111	0.		
112	7.		
113	8.		
114	0.		

rqw	BACKGR	NINE3R1	NINE3R2
115	0.		
116	0.		
117	14.		
118	9.		
119	40.		
120	42.		
121	46.		
122	42.		
123	47.		
124	2.		
125	3.		
126	2.		
127	3.		
128	3.		
129	2.		
130	7.		
131	6.		
132	2.		
133	2.		
134	4.		
135	6.		
136	8.		
137	10.		
138	9.		
139	9.		
140	4.		
141	6.		
142	5.		
143	3.		
144	7.		
145	6.		
146	6.		
147	5.		
148	3.		
149	5.		
150	11.		
151	7.		
152	2.		
153	3.		
154	5.		
155	2.		
156	5.		
157	5.		
158	0.		
159	4.		
160	1.		
161	2.		
162	11.		
163	3.		
164	2.		
165	3.		

[illegible]

September 11, 1979

Mr. James A. Walsh
Building Inspector
Town of Niagra
7135 Lockport Road
Niagra Falls, N.Y. 14305

Re: Soil Analysis
93rd Street School
Alcliff Nursery

Dear Mr. Walsh.

As per your request of 9/5/79, be advised that on 9/11/79 a member of this Department's staff based on information supplied in your letter, obtained a sample of the fill material being deposited behind Alcliff Nursery, Town of Niagra, New York.

Be advised that said sample has been forwarded to the N.Y.S. Dept. of Health Laboratories, Albany, New York for analysis.

Very truly yours,

John C. Malinchock
Deputy Chief for
Air Pollution Control

JCM/kb
cc: G. Amery
J. Kahoe

TOWN OF NIAGRA

COUNTY OF NIAGRA, STATE OF NEW YORK
NIAGRA FALLS, N.Y.

7105 LOCKPORT ROAD
NIAGRA FALLS NEW YORK 14305

PHONE 297-2150

September 5, 1979

Niagara County Health Dept.
10th and East Falls
Niagara Falls, N.Y. 14303

Dear Mr. Maida:

Please accept this letter to confirm our telephone conversation of this date whereby, this office is requesting samples be obtained from the dirt fill being stored behind Alcliff Nursery on Military Road, in the Town of Niagara.

This material was removed from the baseball field at the 93th St. School in the Love Canal Area.

Please test this material and send a copy of the report to this office.

Respectfully,

James A. Walsh
Building Inspector
Town of Niagara

JAW/pc

Cromwell Business Forms, Albany, N.Y. 12201

NEW YORK STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORIES AND RESEARCH-ENVIRONMENTAL HEALTH CENTER
ALBANY, N.Y. 12201

REQUEST FOR ANALYSIS

FOR LAB USE ONLY

LAB ACCES NO. ___ YEAR ___ LAB ___ ACC. NO. : SAMPLE REC'D. ___ MONTH ___ DAY ___ HOUR :

TESTING PATTERN ___ NUMBER OF RECORDS ___ :

PROGRAM CODE ___ : NAME 93rd ST. School N.F.N.Y.

SAMPLING SITE

NO. OF SAMPLES IN SHIPMENT

A. NUMBERED STATION-STA. (SOURCE) NO. ___ :

B. UNNUMBERED SITE-DRAINAGE BASIN NO. ___ : N.Y. GAZETTEER NO. 3102 :

LOCATION (CITY OR TOWN) NiaGara Falls COUNTY Niagara

LATITUDE 4 ° ' " N LONGITUDE 7 ° ' " W :

COMMON NAME, SUBWATERSHED, MILE POINT A.L.C.L.I.F.F. NURSERY

Military Rd. Rear of Property

: (75 CHAR. MAX.)

EXACT DESCRIPTION OF SITE (50 CHARACTERS MAX.) ___ :

TIME OF SAMPLING

GRAB/COMPOSITE FINISH 09 MONTH 05 DAY 12 HOUR : —

COMPOSITE START ___ DAY ___ HOUR : ELAPSED TIME: ___ DAYS ___ HOURS

COMPOSITE ACCORDING TO TIME: ___ ML. EVERY ___ MIN.

COMPOSITE ACCORDING TO FLOW: VOLUME REPRESENTED BY SAMPLE ___

TYPE OF SAMPLE (SELECT FROM LIST) ___ : DESCRIPTION: Soil Sample

COMPLAINTS, OBSERVATIONS, REASONS FOR SUBMISSION

☐ ILLNESS	☐ IMPAIRED USAGE	☐ ROUTINE SURVEIL	☐ INTERRUPTION IN CHLORINATION
☐ TASTE/ODOR	☐ STANDARDS VIOL.	☐ SPECIAL STUDY	☐ REPAIRS IN DISTRIBUTION SYSTEM
☐ TURBIDITY	☐ FISHKILL	☐ NEW EQUIP. OR PROC.	☐ IMPROPER SHIELDING OF WELL
☐ COLOR	☐ ALGAE, WEEDS	☐ EQUIP. FAILURE	☐ APPARENT SOURCE OF POLLUTION
☐ CORROSION :	☐ NATURAL DISASTER :	☐ OTHER :	☐ OTHER :

REPORT RESULTS TO (NO. OF COPIES): CO 1 RO 2 LPHE 1 LHO ___ FED ___ 0 : ENTER 0, 1, OR 2

ATTENTION OF: AMERY G. :; (10 CHARACTERS MAX.)

J. Malinchock
SUBMITTED BY ___ TITLE

SOURCE OF POLLUTION

DISTANCE ___ TYPE ___

TYPE OF WELL CONST.: ___

CHARACTER OF SOIL: ___

OTHER OBSERV. ___

DATA AND FIELD MEASUREMENTS

CLOUD COVER (%) ___ WATER TEMP. °C ___

AIR TEMP. °C ___ pH (UNITS) ___

TREATMENT DATA

PRECHLORINATION lb/M gal. ___

POSTCHLORINATION lb/M gal. ___

REQUIRED TESTS

~TERIOLOGIC TESTS REQUIRED

ROU('OTABLE WATER (01—1)
STANDARD PLATE COUNT 026800
TOTAL COLIFORMS MF 027000
FIELD REPORT: TOTAL CHLORINE RESIDUAL 002101

POTABLE WATER WITH NITRATES & CHLORIDES (02—1)
STANDARD PLATE COUNT 026800
TOTAL COLIFORMS MF 027000
CHLORIDES 001001
NITRATES 000801

PUBLIC WATER SUPPLY INSPECTION (03—1)
STANDARD PLATE COUNT 026800
TOTAL COLIFORMS MF 027000
FIELD REPORT (ALL OR PART OF FOLLOWING): PRECHLOR. 029125
POSTCHLOR. 029225, TOTAL CHLOR. RESIDUAL 002101,
CHEM. TYPE 029300, CHEM. AMOUNT 029425

BATHING BEACH (04—1)
TOTAL COLIFORMS MF 027000
FECAL COLIFORMS MF 027200

CHLORINATED POOL (05—1)
STANDARD PLATE COUNT 026800
TOTAL COLIFORMS MPN 026900
FIEL(ORT: TOTAL CHLORINE RESIDUAL 002101

NON-POTABLE WATER (SURFACE) (06—1)
TOTAL COLIFORMS, MF 027000

NON-POTABLE WATER (CHLOR. SEWAGE) (09—1)
TOTAL COLIFORMS, MPN 026900

TERIOLOGICAL TESTS REQUIRED IN ADD. TO ABOVE
FECAL COLIFORMS, MF 027200, MPN 027100

REQUEST FOR MICROSCOPIC ANALYSIS

CHEMICAL TESTS REQUIRED

ROUTINE SANITARY ANALYSIS (10—2)

- ☐ ALL OF THE FOLLOWING
- ☐ FREE AMMONIA NITROGEN 000501
- ☐ NITRITE NITROGEN 000709
- ☐ NITRATE NITROGEN 000801
- ☐ CHLORIDES 001001
- ☐ ALKALINITY (METH. ORANGE) 001501
- ☐ ALKALIN. (PHENOLPHTHALEIN) 001401
- ☐ pH IN LAB 001900
- ☐ SUSPENDED MATTER 005001
- ☐ VOL. SUSP. MATTER 005101
- ☐ TOTAL PHOSPHATES 007101
- ☐ TOTAL RESIDUE 002501
- ☐ TOTAL VOLATILE RESIDUE 002601
- ☐ ORGANIC NITROGEN 003101
- ☐ SETTLEABLE MATTER (½HR) 004713
- ☐ SETTLEABLE MATTER (1HR) 004813
- ☐ SETTLEABLE MATTER (2HR) 004913
- ☐ B.O.D. (5 DAY) 005601
- ☐ C.O.D. 006501

CHEM. ANALYSIS-POT. WATER (11—2)

- ☐ ALL OF THE FOLLOWING
- ☐ COLOR 000100
- ☐ TURBIDITY 000200
- ☐ ODOR, HOT 000300
- ☐ ODOR, COLD 100300
- ☐ FLUORIDES 000401
- ☐ pH IN LAB 001900
- ☐ MANGANESE 010201
- ☐ IRON 010001
- ☐ FREE AMMONIA NITROGEN 000501
- ☐ ALBUMINOID NITROGEN 000601
- ☐ NITRITE NITROGEN 000709
- ☐ NITRATE NITROGEN 000801
- ☐ OXYGEN CONSUMED FROM PERMANGANATE 000901
- ☐ SODIUM 010701
- ☐ CHLORIDES 001001
- ☐ HARDNESS (TOTAL) 001101
- ☐ ALKALINITY (METH. ORANGE) 001501
- ☐ ALKALINITY (CARBONATE) 001601
- ☐ ALKALINITY (BICARBONATE) 001701

CHEM. ANALYSIS-POT. WATER (12—2)

- ☐ ALL OF THE FOLLOWING (IN ADDITION TO [11—2])
- ☐ CYANIDES 002901
- ☐ MBAS 003001
- ☐ TOTAL PHOSPHATES 007101
- ☐ ARSENIC 008301
- ☐ BARIUM 008401
- ☐ BERYLLIUM 009501
- ☐ BORON 009601
- ☐ SILVER 010601
- ☐ TITANIUM 010801
- ☐ CADMIUM 009701
- ☐ TOTAL CHROMIUM 009801
- ☐ COPPER 009901
- ☐ LEAD 010101
- ☐ LITHIUM 012501
- ☐ MERCURY 010301
- ☐ POTASSIUM 010401
- ☐ SELENIUM 010501
- ☐ ZINC 010001
- ☐ PHENOLS 002701
- ☐ SULFATES 002401
- ☐ TOTAL DISSOLVED SOLIDS 002001

POTABLE WATER PHYSICAL EXAM (08—1)

- ☐ ALL OF THE FOLLOWING
- ☐ COLOR, TRUE 000100
- ☐ TURBIDITY 000200
- ☐ ODOR, HOT 000300
- ☐ ODOR, COLD 100300
- ☐ pH IN LAB 001900
- ☐ COLOR APPARENT 100100

OTHER CHEM. TESTS REQUIRED

- ☐ SPECIAL TEST PATTERN NO. ☐☐—☐
- ☒ Organic Chlorides
- ☒ BHC
- ☒ Lindane
- ☐

Map scale 1/__________

R(nce Latitude 4° ____ ____ ____

Vertical distance ______ mm (+ if north, — if south of reference line)

'ference Longitude 7° ____ ____ ____

'al distance ______ mm (+ if west, — if east of reference line)

NIAGARA COUNTY
DEPARTMENT OF HEALTH

Code Activity ....

Code Location ....

Service Request No. ....

Date Received Complaint ....

Service Request [illegible]

Originator of Complaint [illegible] Address

Owner Address

Occupant [illegible] Address [illegible]

Date	Hours	REPORT OF INVESTIGATION
9/5 79	1:00	Visited grounds around 93rd St. School and found workmen filling in a baseball diamond with a light orange-brown soil. The original surface soil has apparently been scraped away to a depth of a foot or more and the remaining soil covered with plastic before the new soil is added. A pile of what appears to be the soil removed from the diamond is sitting nearby. This soil is very dark in color, almost black. The trucks bringing in the new soil are owned by Walter J. Kozdranski.
		[illegible signature]
9/5/79	4:10	Visited [illegible] Nursery and spoke to Charles [illegible]. He said he had heard that they had received soil from the 93rd St. School and showed me the area at the rear of the nursery where he thought the soil had been dumped. Inspected this area ~~[illegible]~~ and found several piles of freshly dumped soil. This soil was also very dark and appeared to be the same type of soil I viewed at the 93rd St. School. Filled a large mason jar with this soil as a sample to be used for testing.
		[illegible signature]

Date Abated .... By ....

From " Preliminary investigation & public report . . . "

NAME

ALCLIFF LANDSCAPING (DEC #932070)

LOCATION

The site is located behind Alcliff Landscaping, Inc., 1975 Military Road in the Town of Niagara.

A site sketch is attached

OWNERSHIP

The site is owned by Alcliff Landscaping and Nursery, Inc., 1975 Military Road, Niagara Falls, NY 14304. Any correspondence should be directed to Martin A. LaMarca, Vice President (297-3590).

HISTORY

In September, 1979, the Walter S. Kozdranski Company excavated roughly 15 tandem dump loads of topsoil from the baseball and football fields at the 93rd Street School in Niagara Falls, under contract to the Board of Education. The topsoil was alledged to be contaminated from contact with material removed from the Love Canal in the 1950's. Kozdranski back filled the ballfields with clean soil after placing a plastic liner.

Kozdranski brought the excavated soil to Alcliff Landscaping where it was stored in an area behind the Alcliff building. According to Mr. LaMarca, the DEC informed Alcliff that this material could not be disposed without a permit and ordered the soil removed. Reportedly, within one week of arrival at Alcliff, Kozdranski removed the material and transported it to CECOS, where it was used for landfill cover material.

Currently, the area which previously held the material from 93rd Street is level and rough graded. This area was previously filled in 1973 or 1974 to raise the grade in a former wetland. Clean fill including debris from the demolition of 4th Street were used for fill. Several piles of fill material (soil and wood chips) are located nearby. The fill piles are orderly. There is no visible evidence of chemical contamination.

In the future, this area may be developed as a residential subdivision.

EXAMINATION OF MAPS AND AERIAL PHOTOGRAPHS

A review of USGS topographic maps, Tonawanda west - 7½′ series and USDA aerial photographs ARE 3V-82 (1958), ARE 2V-31 (1958) and ARE 2GG-27 (1966) revealed little information about the previous land use. The land was apparently swampy and lightly wooded in 1958. At this time, most of the surrounding area was cultivated. By 1966, the surrounding area was developed to near its present extent.

EXAMINATION OF MAPS AND AERIAL PHOTOGRAPHS (continued)

The site received the material from 93rd Street in 1979. There were no available photographs taken in 1979 and therefore, no information on possible dumping was available.

PREVIOUS SAMPLING AND ANALYSIS

There is no record of previous sampling at this site or of the material excavated from 93rd Street on file with the Niagara County Health Department. Mr. LaMarca is unaware of any previous sampling.

SOILS/GEOLOGY

The USDA Soil Conservation Service, Soil Survey for Niagara County lists the natival soil in this area as Lakemont silty clay loam. These soils are generally deep, poorly to very poorly drained and level or depressional in relief. Lakemont soils are normally ponded during wet periods.

The area of the previous storage site, has been elevated several feet using demolition debris (concrete, etc) to fill a formerly low, marshy area. Digging in this area is likely to be difficult due to the size of the concrete rubble (6' diameter or larger).

Bedrock is Lockport Dolomite of over 120 feet in thickness.

GROUNDWATER

A localized perched aquifer is expected above the original Lakemont soils. According to Mr. LaMarca this aquifer is expected to flow to the southeast due to the drainage prior to filling.

The Lockport Dolomite may contain several water bearing zones. A well recently drilled on site 150 feet west of the old storage area is said to be 43 feet deep with 26' of water. The direction of movement of groundwater aquifers is not known. Bedrock wells in this area commonly contain noticeable quantities of hydrogen sulfide, thus providing low quality drinking water. Many wells are still used for non-drinking uses. Public water is available, however, there may be some wells used for drinking within a 2 mile radius. The location of specific wells, other than the on-site well was not determined.

The potential for any groundwater contamination is suspected to be small due to the small amount of toxic material present, if any, and the slow permeability of the Lakemont soils.

SURFACE WATER

The nearest surface water is Cayuga Creek, which is 1000 feet west of the site. Cayuga Creek flows south to the Niagara River, 2 miles away. No drinking water or industrial water is taken from Cayuga Creek. The City of Niagara Falls drinking water intakes are located 3 miles down stream from the mouth of Cayuga Creek.

SURFACE WATER (continued)

The site is not within any flood plain although the area was ponded prior to fill placement. There are not major wetlands with 2 miles although scattered small areas of 1 acre or less can be found.

AIR

Air quality problems are not expected. If any contaminated material was not removed, only small quantities are expected to remain.

The nearest residence is 300 feet southeast of the site (Effie Drive). There have been no complaints of odors received by the Niagara County Health Department. It is estimated that 500 to 1000 people live within 1 mile of the site and roughly 3000 within 2 miles.

FIRE AND EXPLOSION

There is no possibility of fire or explosion at this site.

DIRECT CONTACT

If all contaminated material was removed from the site, there is no danger of direct contact. Contact is possible if the material was not removed completely.

CONCLUSION

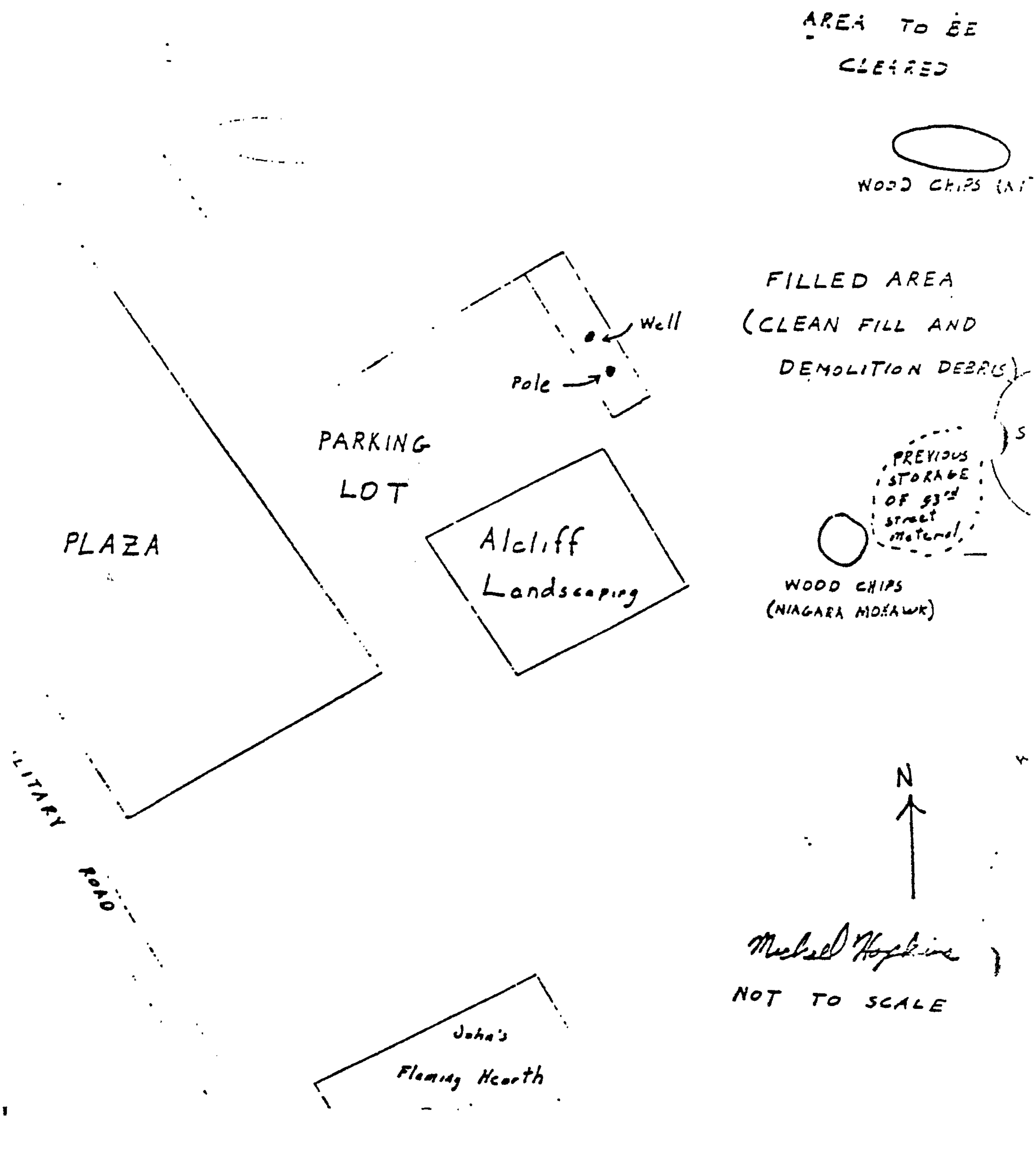
There should be no problems here if all the material from the 93rd Street School was removed. This topsoil was never confirmed to be hazardous. If any contaminated soil remains, it should be removed. Sampling is needed to confirm its presence or absence.

Sampling should include surface sampling at random points in the previous storage area. Random samples could be taken from nearby areas as well. Samples taken at depths of 2 to 3 feet should confirm that no contaminated material was buried here.

The on-site well could be sampled to check for groundwater contamination, although the direction of groundwater flow is not known.

ALCLIFF LANDSCAPING

DEC SITE # 932070



297 3590

FOR BEAUTY
ECONOMY
ENJOYMENT

LANDSCAPING ARCHITECTS

Alclin Landscaping & Nursery, Inc.

TIN A. LaMARCA
VICE PRESIDENT

1975 MILITARY ROAD
NIAGARA FALLS N Y 14304

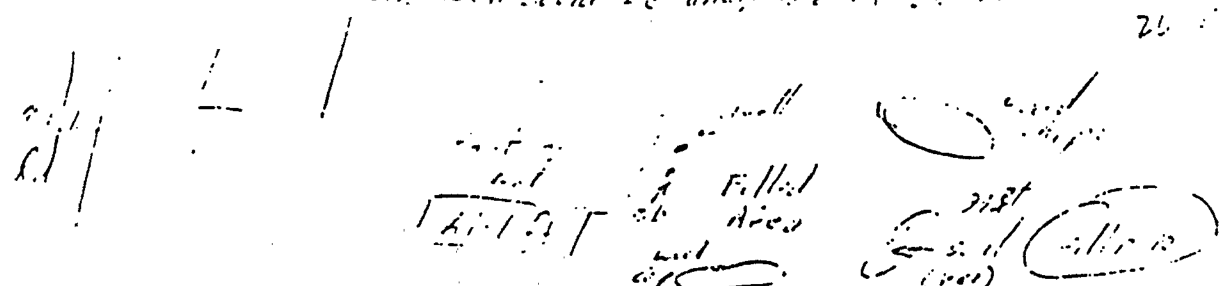
US WASTE DISPOSAL SITE REPORT
DEPARTMENT OF ENVIRON. L. CONSERVATION

ndscaping Region: 9
Town/City Niagara
y Road

Material excavated from 93rd Street School. Check for contamination of soil by material placed at 93rd Street School from Love Canal in the 1950's.

LaMarca [illegible]

[illegible] The area was filled with [illegible] fill and [illegible]. This area may be developed in the future. A [illegible] well could be [illegible] 43 [illegible]



Type of Site: Open Dump ☐ Landfill ☒ Structure ☐ Treatment Pond(s) ☐ Lagoon(s) ☐ Number of Ponds____ Number of Lagoons____

Estimated Size ________ Acres

Hazardous Wastes Disposed? Confirmed ☐ Suspected ☒

*Type and Quantity of Hazardous Wastes:

TYPE	QUANTITY (Pounds, drums, tons, gallons)
Material excavated from 93rd St. School	Unknown

*Use additional sheets if more space is needed.

The material from 93rd Street is now removed from area. All material from 93rd street was taken to CECOS [illegible] W/S Kordecki [illegible]

INTERIM REPORT

RE: Niagara Falls - 93rd and 66th Street Schools
Site Surveys and Soil Sampling

A meeting with Mr. Wilfred Young, Principal of the 93rd Street School, was held on 9/11/78 at 9:30 a.m. regarding the site just south of school property where higher than normal levels of radiation were found. Mr. James Adams of the City Planner's office provided information on the location of the school property line (see map).

The school building and property were surveyed on 9/9/78 at 2:30 p.m. by myself and Mr. Robert Wozniak of D.E.C. (see memo to Dr. Campbell dated 9/12/78 re same). All readings for external gamma as well as radon on school grounds showed no significant levels above normal background. Background rates varied from 7-10μR per hour for gamma, and 0 CPM for radon. Dr. Fred Haywood and Woodrow Cottrell of Oakridge National Labs (DOE) accompanied me on a resurvey of the areas which were soil tested 8/23/78 on the Love Canal by Mr. O'Brien (BAO), Dr. Mueller (Albany), and myself, and those locations on the 93rd Street lot which were found to be above background. At those locations where the highest dose rates were found, charcoal filters were placed for radon collectors. Filters will be collected 9/12/78, 24 hrs. later.

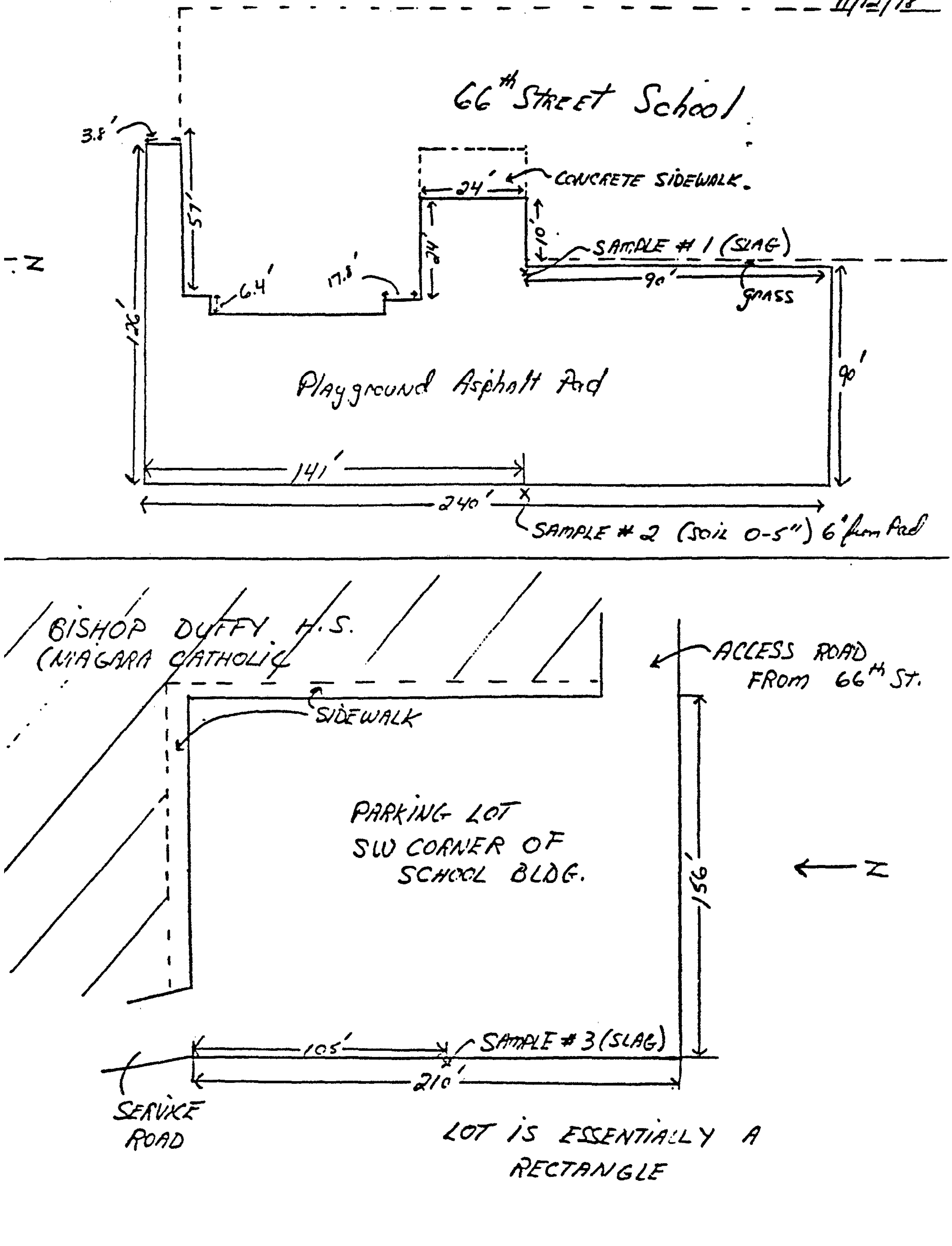
Soil sampling of the vacant lot due south of the 93rd Street School property started at 10:15 a.m. Four sites were selected for sampling on the basis of highest possible surface reading in the area. A fifth site was selected adjacent to the area for normal background level comparison. Sample holes were dug with the assistance of a power auger on the back of a tractor supplied by D.E.C. Mr. Joe Slack and Mr. Paul Counterman lent great assistance in the sampling and mapping procedures. Dr. Haywood and Mr. Cottrell (DOE) took samples at all sites which are identical to all samples taken by me for the NYSHD and EPA. They also performed independent dose rate measurements for external gamma and beta radiation present.

Samples were then collected from the playground area behind the 99th Street School where higher than normal readings were found. A hole was cut into the asphalt at a point where the highest reading was found, and it was discovered that some type of rock bed material under the asphalt was the source of activity. The material appeared to be a combination of limestone and slag material. Samples of the material were collected and established as priority samples for analysis. Investigation has already begun on the source of this material by identifying contractors and construction firms for the 99th Street School.

At 4:30 p.m., Dr. Haywood, Mr. Cottrell, and myself went to the 66th Street School for an initial survey of the property. An area of higher than normal activity -60μR/HR was found in the playground area directly behind the school. It was thought that this was the same material that was found at the 99th Street School since the 66th Street School is a carbon copy of 99th, and they were probably built by similar contractors within a similar time span. We then proceeded to survey the land adjacent to Niagara Catholic High Schools and found that the parking lot in the southwest corner of the Bishop Duffy section of the school also contained activity (dose rates) similar to the 66th and 99th Street Schools. No sampling of these new sites on 66th Street will be done until analysis on the samples collected at 99th Street School

MAP OF SAMPLING LOCATIONS FOR 66TH STREET SCHOOL AND BISHOP DUFFY HIGH SCHOOL

11/12/78



Lrrd Conred RECEIVED

MAR 30 1979

J. Matuszek - Radiological Sciences Laboratory
T. Cushman - Radiation
Request for Radon & Ionizing Radiation Readings at 93rd Street School

March 26, 1979

You requested Bill Hollcher on March 22 to provide the readings taken last fall at the 93rd Street School by Bob Wozniak, Senior Engineering Technician-DEC and Dave Dooley, Radiological Health Specialist-State Health Department. Attached are readings provided by a call from Bob Wozniak to the Bureau on September 11, 1978.

Bob Wozniak was providing support to the State Health Department on this survey including the instrumentation for measuring the radon and the external radiation. He determined the number of counts obtained from a five minute air sample and Dave Dooley calculated the equivalent working level of radon.

It was anticipated that the report to the State Health Department would include the data obtained in the survey for your review and evaluation. I called Bob Wozniak on March 23 to obtain a copy of the report. He obtained a copy from Bill O'Brien and advised that the date was not included in the 9/12 report but was referred to as being at background levels.

The data for external ionizing radiation in the school falls in the general range of ionizing radiation observed in the environment with the exception of the somewhat higher reading "on contact" for the tiles in the gymnasium. The data for the radon levels falls within the range of measurements made in a DOE study of 21 homes in the New York-New Jersey area. The 93rd Street School results are in the upper portion of this range. The radon results are higher than those measured at the Lewport School near the Lake Ontario Ordnance Works site using the same instrumentation in a one day survey. The first and second floor radon results are also within the range of radon levels reported by EPA for 21 homes in Florida. Twelve of these homes are believed to be on reclaimed land from phosphate ore mining and generally have the higher levels.

A one year study of tho effect of radon releases from the site on the environs and selected homes around the LOCW is being carried out by DOE with DEC cooperation. This includes one sampling location with the Lewport School. The above information indicates that it would be prudent to also verify the radon levels at the 93rd Street School with instrumentation that will provide average concentrations over two to four week periods.

TJC:sl
Attachment
cc: D. Dooley
R. Woaniak
W. Kelleher
H. Prias
F. Haag

Department of Health
OFFICE OF PUBLIC HEALTH SERVICES

M E M O R A N D U M

September 12, 1978

To: Dr. LaVerne Campbell, Regional Health Director

From: David A. Dooley, Senior Radiological Health Specialist DD

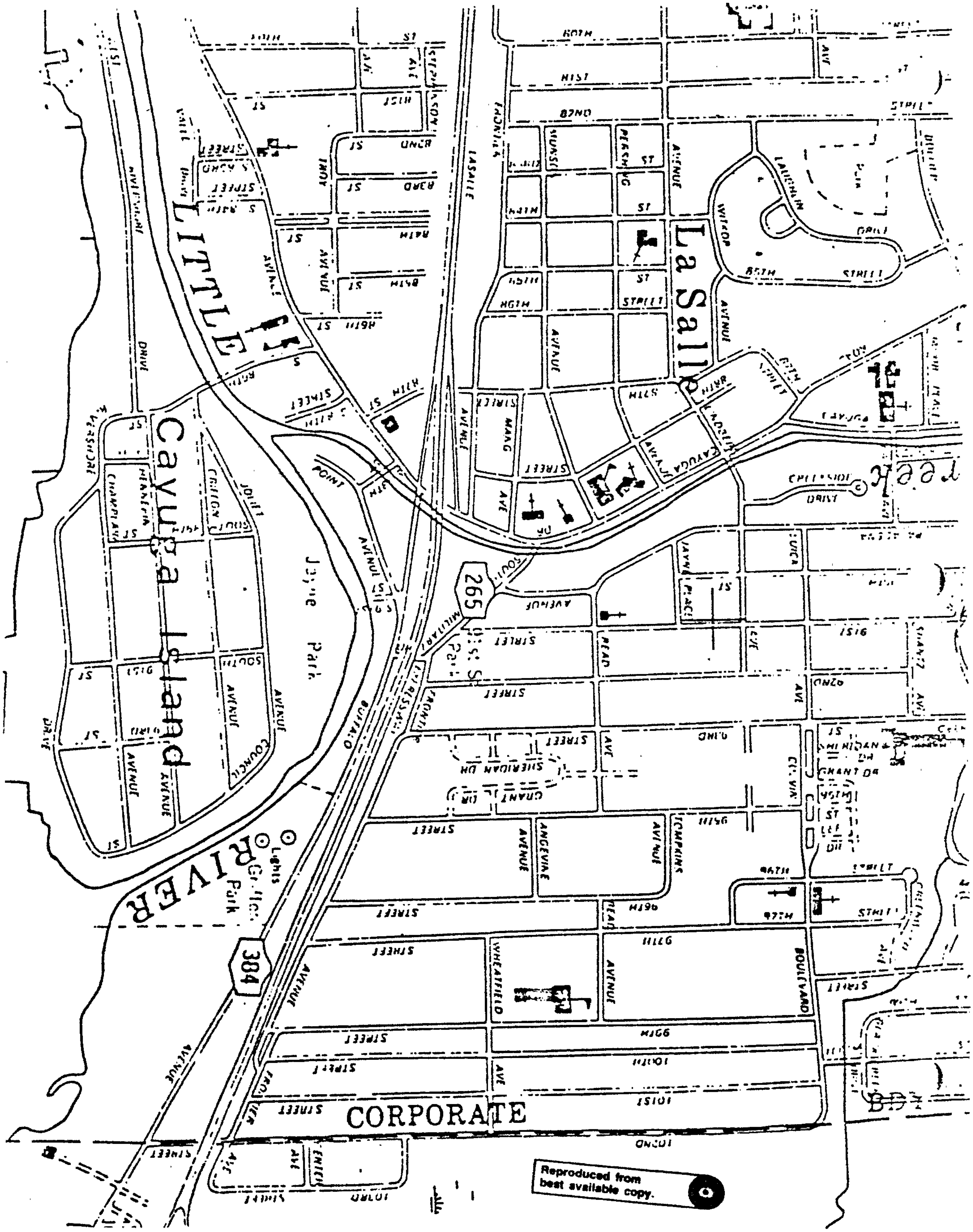
Subject: 93rd Street School Radiation Measurement

On September 9, 1978 at 2:30 p.m., Robert Wozniak of the Department of Environmental Conservation and David Dooley of the New York State Department of Health performed a survey of the school property for possible presence of radon and external gamma hazards due to the proximity of the school grounds to a known site of external gamma levels of approximately 60μR/hr. All external gamma measurements taken inside the school showed no readings that were significantly higher than normal background levels (8μR/hr.). In addition, all air sampling inside and outside the school for radon also gave no significant readings above background.

Therefore, we conclude that, except for the problem of the strip of land adjacent to the school property, the school itself and all its property is radiation-free and presents no significant health hazard.

DAD/ki

cc: Mr. Robert LaSala, Niagara Falls Assistant City Manager
Dr. Robert Utter, School Superintendent
Mr. Wilfred Young, Super. Principal, 93rd Street School
Mr. Robert Wozniak - Department of Environmental Conservation


LITTLE
RIVER
Cayuga Island
La Salle
CORPORATE
265
304
Jayne Park
CAYUGA
SHERIDAN DR
GRANT DR
BOULEVARD
AVENUE
STREET

Response to:

Niagara County Health Department's
April 26, 1986 Comment Letter

STATE OF NEW YORK
DEPARTMENT OF HEALTH

Corning Tower The Governor Nelson A. Rockefeller Empire State Plaza Albany, New York 1

David Axelrod, M.D.
Commissioner

June 16, 1988

RECEIVED
JUN 16 1988
BUREAU OF WESTERN REMEDIAL ACTION
DIVISION OF HAZARDOUS WASTE REMEDIATION

Mr. Jack Willson
Bureau of Western Remedial Action
NYS Dept. of Environmental Conservation
50 Wolf Rd. - Rm. 222
Albany, NY 12233

Dear Mr. ~~Willson~~ Jack

In our letter of June 13, 1983 we addressed concerns regarding the surface soils of the 93rd Street School. The Department also has concerns regarding high PAH levels in the subsurface soils. The future land use of the 93rd Street School and its grounds are unknown at this time. It is possible that construction may be considered in the future and could involve the excavation of subsurface soils for the placement of foundations and/or basements. Since this may occur it is appropriate to consider excavation of "hot spots" where PAH levels are high. A review of the data indicates these "hot spots" are 4-6 feet beneath the ground surface and have PAH levels up to 300 ppm. The Department believes it would be necessary to excavate those areas to minimize the potential exposure should the area be redeveloped or developed in the future.

Should you have any questions please contact me at 458-6310.

Sincerely,

Ron

Ronald Tramontano
Director
Bureau of Environmental Exposure
Investigation

jlh/81680337

cc: Dr. Kim
Dr. Hawley
Mr. Wakeman
Mr. Pavlou
Mr. Violanti/Ms. Rusin - Buffalo R

cc R. S[illegible]
A. Nagi
file
93rd St School

STATE OF NEW YORK
DEPARTMENT OF HEALTH
Corning Tower The Governor Nelson A. Rockefeller Empire State Plaza Albany, New York 1223.

David Axelrod M D
Commissioner

June 13, 1988

Mr. Jack Willson
NYS Dept. of Environmental Conservation
50 Wolf Rd.
Room 222
Albany, NY 12233

Dear Mr. Willson

As requested by your office we have reviewed April 26, 1988 comments made by the Niagara County Health Department, Mr. Michael Hopkins, regarding the 93rd Street School Remedial Investigation/Feasibility Study Report. Mr. Wakeman's March 2, 1988 letter to Mr. Schick of your Department stated that areas with elevated total PAH levels should be excavated to a depth of at least 2 1/2 feet and the soil appropriately disposed or treated. The entire area should be covered using appropriate methods and with as little change in the present elevation as possible. The letter further referenced 4 areas which showed total PAH concentrations ranging from 9.9 to 76.6 ppm.

The decision to recommend excavation of those areas and covering the entire area with clean soil was based upon the following factors:

1. The area in question is a filled area in which low lying swales were filled in with soil that presumably came from the Love Canal area.

2. Some soil log borings made references to the presence of cinders thus possibly indicating the presence of fly ash. A previous 1979 report by Earth Dimensions also indicated the presence of fly ash in the soil log borings in essentially the same areas.

3. Dioxin in the surface soils and subsurface soils have been shown to be present in past surveys or investigations.

4. The soil sampling methodology used (such as 0 to 6 inches and 0 to 1 foot) does not adequately characterize the conditions of surface soils of a depth of 0 to 2 inches.

5. The area may be used as school grounds in the future or for recreational purposes.

PIPER & MARBURY
1200 NINETEENTH STREET. N.W.
WASHINGTON, D.C. 20036
202-861-3900
TELECOPIER 202-223-2065
CABLE PIPERMAR WSH
TELEX 904246

THOMAS H. TRUITT
DIRECT DIAL NUMBER
202-861-3670

1100 CHARLES CENTER SOUTH
36 SOUTH CHARLES STREET
BALTIMORE, MARYLAND 2120l
301-539-2530

May 24, 1988

<ZH>
Mr. Amarinderjit S. Nagi, P.E.
New York State Department of
Environmental Conservation
Room 222
50 Wolf Road
Albany, New York 12233

Re: United States of America, et al. v. Occidental Chemical Corporation., et al. (Love Canal Landfill); 93rd Street School Superfund Site, Niagara Falls, New York

Dear Mr. Nagi:

This letter and the enclosed comments are submitted on behalf of Occidental Chemical Corporation regarding the Feasibility Study for the 93rd Street School Superfund Site. These comments are being submitted in the spirit of cooperation and not as any expression of culpability or responsibility.

1. The preferred remedial alternative appears to be driven by the presence of arsenic at the site. The arsenic appears to be found in fly ash fill. In the February 1988 USEPA report to Congress entitled "Wastes From The Combustion of Coal by Electric Utility Power Plants," the median arsenic content of ash from Eastern coal is 75 ppm with the range 2.0 to 279 ppm. Table, pg. 3-18. This is well within the range at the site. In addition, the report also states (p. 4-48) that coal ash is used and will be used:

> "as fill in asphalt, road bases, parking lots, housing developments, embankments. . . In the future, numerous other construction applications may use coal ash as fill, particularly if the ash is available at lower cost than standard fill materials."

To remediate the 93rd Street School site on the basis of arsenic in a common fill material like fly ash is inappropriate. As the EPA report indicates, fly ash has been and is in use throughout the country for fill, the same purpose for which it appears to have been used on the 93rd Street School grounds. It would be arbitrary and capricious to spend large sums of money to remediate situations which are present throughout the country and which continue to be created. As long as the ash material is covered, any reasonably postulated threats are mitigated.

2. Polynuclear aromatic hydrocarbons (PAH) are present in asphalt and motor oil. The paved parking area under which PAH were found may well have been used for changing motor oil or may have received motor oil from leaking automobiles. Because these PAH compounds are presently covered with asphalt, there is no reason to remediate these areas.

3. The presence of 2,3,7,8-TCDD in surface soils at the 93rd Street School has not been confirmed. At the reported levels, the presence of 2,3,7,8-TCDD should be addressed by covering with 12 inches of topsoil and vegetation as is being done at other Superfund sites, as described in the attached Region VII USEPA Dioxin Sites Weekly Update of March 11, 1988.

On the basis of the attached comments and the foregoing, Occidental Chemical Corporation requests that the remediation of the 93rd Street School be modified as suggested above.

Sincerely yours,

Thomas H. Truitt

Thomas H. Truitt
Counsel for
Occidental Chemical Corporation

THT/bjw
Enclosure

cc: John Wheeler, Esquire
USEPA OECM

<u>COMMENTS ON THE RI/FS FOR THE 93RD STREET SCHOOL</u>

These comments will focus on two aspects of the data evaluation and risk assessment which are considered inadequate or inaccurate, namely, (1) the comparison of reported concentrations in soil with expected background and (2) the assumptions used to calculate the potential cancer risk level.

The discussions will be limited to arsenic, polynuclear aromatic hydrocarbons (PAH) and 2,3,7,8 tetracholorodibenzo-p-dioxin (TCDD). Although there is some question that the appropriate procedure and evaluation was used to select the indicator chemicals, the RI/FS risk assessment focuses on arsenic, PAHs and TCDD as the chemicals which contribute the most significant risk at the 93rd Street School yard (the Site). Addressing these primary indicator chemicals should reasonably address the total risk from chemicals at the Site.

Exposure to chemicals in soil is the only exposure media which has significant complete exposure pathway. Although inhalation of suspended particles, dermal contact, and ingestion are all potential routes of exposure, ingestion is, by far, the most significant route with respect to the magnitude of exposure. A single daily exposure to soil which is used to assess dose will represent the total dose resulting from the three routes of exposure.

COMPARISON WITH BACKGROUND CONCENTRATIONS:

Arsenic is a significant element in the earth's surface. Average concentrations in soils the world over is 5 ppm. In specific areas arsenic can be much higher. This is true in areas of volcanic action. The dust plume from Mount St. Helen contained 22 ppm arsenic. [1, 2]

Arsenic has been added to the earth's surface environment by man. Many metal ores contain significant levels of arsenic which are dispersed on the surface by mining and smelting operations. Man has distributed a significant amount of arsenic in fertilizers and pesticides (insecticides and herbicides). The Environmental Protection Agency, National Soils Monitoring Program [3] sampled soils from five United States cities and reported arsenic present in 98% of the samples and levels in lawn areas ranged from 0.3 to 50.8 ppm. [4] The National Academy of Science reported even higher concentrations are possible as was noted in the following quotation:

> Large residues have been found on orchard soils that received 30-60 lb. of lead arsenate per acre (34-67 kg/ha) per year from pesticide applications, which began in the early 1900's. The soils have therefore received 1,800-3,600 lb. of lead arsenate per acre (2,020-4,035 kg/ha). This is equivalent to an arsenic concentration of 194-389 ppm, if the arsenate remains in the top 6 in. (15.24cm) of soil. Arsenic was accumulated at up to 2,500 ppm in a fine soil.

Walsh et al. [5] reported soil concentrations in New York State at 3-12 ppm in uncontaminated soil and 90-625 ppm in orchard soil that had been treated. The RI Table 3-5 reports that the New York State background range for arsenic is 7 to 10.6 ppm.

Comparing the above concentrations which are natural in native soils and in agricultural land with the concentrations reported in surface soils at the Site, 52 ppm (maximum) and 0.43 ppm (average above detection limits), it is apparent that the concentrations reported could be expected to occur in this area. Considering that the area around Love Canal was agricultural land and orchards were observed in historical aerial photographs the maximum reported in all samples, 350 ppm (maximum) and 2.7 ppm (average above detection limits), are not unusual. Although the RI determined that arsenic was the primary risk to health at the Site, the arsenic concentrations reported in soil are apparently present over large areas of the State of New York.

Because arsenic is ubiquitous it is present in food and water. Schroeder et al.[6] estimated the average intake of arsenic from food and water as 0.9 milligrams per day. Using the assumption that a young child will consume 100 mg. of surface soil containing the average concentration reported as detected at the site (0.43 mg/kg), the daily arsenic intake from soil would be 0.0000043 mg per day. This would be equivalent to 0.0048% of the estimated daily intake from food and water. If, per chance, the 100 mg. of soil came from the last contaminated sample of soil, the daily intake from soil would be 0.035 mg and would be equivalent to less than 4% of the estimated daily intake of arsenic from food and water. The potential exposure to arsenic from soil at the Site seems inconsequential compared to the estimated daily intake from other sources.

Polycyclic aromatic hydrocarbons (PAH) “occur widely throughout the environment, both as a result of the technological activities of man and as a result of natural production." [7] The primary production by man comes from heating and power production (combustion of fossil fuels). PAH can therefore be found even in remote areas. Tan et al. reported concentrations in the sediment in the bottom of two Adirondack State Park lakes in the State of New York.[8] The following data was taken from their published report:

CONCENTRATION OF PAH
IN SAGAMORE LAKE AND WOODS LAKE SEDIMENT
(ug/kg in 0-4 cm depth)

PAH	Sagamore	Woods
Benz(a)anthracene	78	362
Benzo(b)fluoranthene	358	1,784
Benzo(k)fluoranthene	115	558
Benzo(a)pyrene	128	690
Indeno (1,2,3-cd)pyrene	315	1,294
Chrysene/Triphenylene	191	888

PAH are also found in materials used in construction. Bitumens, which are also known as petroleum asphalt, are commonly used in roofing and paving materials and are reported to contain the following concentrations of the carcinogenic PAH reported at the Site:

RANGE OF PAH REPORTED IN BITUMENS[a(10)]

PAH	RANGE ug/kg
Benz(a)anthracene	0.15-35
Benzo(b)fluoranthene	NR[c]
Benzo(k)fluoranthene	ND--+[b]
Benzo(a)pyrene	0.03-52
Indeno (1,2,3-cd)pyrene	ND-1
Chrysene	0.04-34

a-Eight different bitumen samples
b-ND--Not detected, +--not estimated but present in small amount.
c-Not reported.

Creosote is commonly used as a preservative for posts and lumber. "PAH's (mostly unsubstituted) generally account for at least 75 percent of creosote (Lorenz and Gjoviak, 1972)."[(10)]

Another source of PAH which is common around the building site is used motor oil. Peake et al. reported the following concentrations of PAH in used motor oil:[(9)]

POLYCYCLIC AROMATIC HYDROCARBONS IN USED MOTOR OIL

PAH	ug/ml
Benz(a)anthracene	0.87
Benzo(b)fluoranthene	1.38
Benzo(k)fluoranthene	1.44
Benzo(a)pyrene	0.36
Indeno (1,2,3-cd)pyrene	NR[a]
Chrysene/Triphenylene	2.48

a-NR-Not reported

Foods also contain PAH. Charcoal broiled steak and smoked ham are reported to contain 3.7-50.4 and 0.5-14.6 ppb of benzo(a)pyrene, respectively.[11] Due to the ubiquitous presence in air and the resulting fall-out, leafy vegetables can have comparatively high levels such reported below:[11]

PAH	Lettuce	Spinach
Benz(a)anthracene	6.1-15.4	16.1
Benzo(a)pyrene	2.8-12.8	7.4
Chrysene	5.7-26.5	28.0

Comparing the concentrations reported above with the concentrations reported in surface soil in the RI it is apparent that the PAH concentrations are within the range that would be expected to occur in an urban/suburban area. The occasional sample containing comparatively higher concentrations could easily be the result of contamination with materials related to school construction or paving of drives and parking lots.

TCDD environmental distribution has been studied extensively, but because the analytical programs generally relate to areas of expected contamination, data which can be used to evaluate background concentrations are not available at this time. TCDD can theoretically be produced by natural combustion processes and has been reported in soot. It is also reported in ash. Because TCDD can be produced in the combustion of organic material, especially the combustion of trash and municipal wastes, TCDD is probably ubiquitous in the urban/suburban environment.

Although a comparison with background data is not possible, this is an appropriate place to discuss the RI/FS application of the 1 ppb TCDD limit for a level of concern in soil. The RI/FS states that this limit is exceeded because a single sample exceeded this limit although scores of samples were below 1 ppb or non-detect. In the original report which established the 1 ppb level of concern, Kimbrough et al. stated that their estimate of human intake of TCDD assumed “uniform distributions of TCDD in soil at 1 ppb." This assumption is discussed further where they state, "It must be stressed that the exposure assessments used in estimating risks for carcinogenicity and reproductive health effects contain critical assumptions that are not likely to be actually encountered. Most prominent of these is the assumption of uniform levels of contamination throughout the living space."(12) The RI/FS has taken a single sample exceeding 1 ppb and assumed that this represented a uniform distribution of 1 ppb over the entire area. This is totally unrealistic when there is a significant body of data which states that the average concentration is well below the 1 ppb level of concern. TCDD is not a chemical of concern at this site.

<u>CALCULATION OF CANCER RISK FROM ARSENIC, PAH AND TCDD CONTAMINATION OF THE SOIL</u>.

The following tables present a comparison of the assumptions used in the RI/FS risk assessment and set of assumptions which are considered to more closely meet the EPA definition of a probable worse case scenario. The justification for changing the assumptions are presented for each scenario. These tables present the risk level calculated for each set of assumptions.

Examination of the risk levels calculated for the probable worse case assumptions show risk levels that are acceptable (less than 10^{-6}) in all cases except one where the total risk is slightly greater at $4.9X10^{-6}$. This risk level would be considered acceptable because it applies to a worse case exposure scenario. The risk determination also uses the more stringent EPA potency value which is being evaluated and a recent report suggests that this value will be decreased by a factor of 16. This would lower the total risk of this exposure scenario (Ingestion, undisturbed site) to $1X10^{-6}$.

COMPARISON OF RI/FS WITH PROBABLY WORSE CASE ASSUMPTIONS
UNDISTURBED SITE

Assessment Input	RI/FS Assumptions[a]	Probable Assumptions[b]	Ratio of RI/FS To Probable[c]
SCENARIO 1--INHALATION			
Concentration in soil-mg/mg			-
Arsenic	4.3E-07	8.6E-08	5
PAH[d]	3.2E-08	6.5E-09	5
TCDD	NOT INCLUDED IN ASSESSMENT		
Soil Expos. mg/M^3	0.0525	0.0105	5
Air intake M^3/day	20	20	1
Receptor's Weight-kg	70	70	1
Exposure duration			
hours	24	8	3
days/yr.	365	91	4
years	70	70	1
Total-hrs.	6.1E+05	5.1E+04	12
Exaggeration in assumptions (5X5X12=300):		300	
Risk			
Arsenic	6.1E-06	2.2E-08	
PAH	5.6E-08	1.9E-10	
Total	6.106E-6	2.202-08	

-Assumptions as presented in Exhibit 1, RI/FS.
-Assumptions which more reasonably meet the EPA requirement for “probable worse case” exposure assessment.
-Ratio of RI/FS assumptions and the more reasonable probably worst case assumptions.
-Sum of the carcinogenic PAH used in estimating the inhalation exposure in the RI/FS.

COMPARISON OF RI/FS WITH PROBABLE WORST CASE ASSUMPTIONS
UNDISTURBED SITE

Assessment Input	RI/FS Assumptions[a]	Probable Assumptions[b]	Ratio of RI/FS To Probable[c]
SCENARIO 2--INGESTION			
Concentration in soil-mg/mg			-
Arsenic	5.2E-05	4.3E-07[f]	120
PAH	9.7E-06	5.7E-08[f]	170
TCDD	1.2E-09	2.16-10[e]	4.6
Soil Exp. mg/day	100	100	1
Receptor (child) weight	17	17	1
Exposure duration			
days/year	182	91	2
years	5	5	1
Exaggeration in assumptions			
Arsenic --240			
PAH --340			
TCDD --9.2			
Risk			
Arsenic	1.6E-04	6.7E-07	
PAH	2.4E-05	7.1E-08	
TCDD	3.9E-05	4.2E-06	
Total	2.2E-04	4.9E-06	

a-Assumptions as presented in Exhibit 1, RI/FS.
b-Assumptions which more reasonably meet the EPA requirement for "probable worse case" exposure assessment.
c-Ratio of RI/FS assumptions and the more reasonable probable worse case assumptions.
d-Sum of the carcinogenic PAH used in the assessment presented in the RI/FS.
e-Average for TCDD calculated using detection limit where non-detects were reported. (NUS Corporation report dated March 20, 1986)
f-Mean of concentrations used to estimate inhalation exposure in the RI/FS.

COMPARISON OF RI/FS WITH PROBABLE WORST CASE ASSUMPTIONS
DISTURBED SITE

Assessment Input	RI/FS Assumptions[a]	Probable Assumptions[b]	Ratio of RI/FS To Probable[c]
SCENARIO 1--INHALATION			
Concentration in soil-mg/kg			-
Arsenic	2.7E-06	1.3E-06	2
PAH[d]	3.4E-07	1.7E-07	2
TCDD	NOT INCLUDED IN ASSESSMENT		
Soil Expos. mg/M^3	10	1	10
Air intake M^3/day	10	10	1
Receptor's weight-kg	70	70	1
Exposure duration			
hours	8	8	1
days/yr.	260	65	4
years	1	1	1
Total-hrs.	2,080	520	4
Exaggeration in assumptions (2X10X1X1X4=80) 80			
Risk			
Arsenic	1.8E-05	2.0E-07	
PAH	2.1E-07	2.6E-09	
Total	1.802E-05	2.003E-07	

a-Assumptions as presented in Exhibit 1, RI/FS.
b-Assumptions which more reasonably meet the EPA requirement for “probable worse case” exposure assessment.
c-Ratio of RI/FS assumptions and the more reasonable probable worst case assumptions.
d-Sum of the carcinogenic PAH used in estimating the inhalation exposure in the RI/FS.

COMPARISON OF RI/FS WITH PROBABLE WORST CASE ASSUMPTIONS
DISTURBED SITE

Assessment Input	RI/FS Assumptions[a]	Probable Assumptions[b]	Ratio of RI/FS To Probable[c]
SCENARIO 2--INGESTION			
Concentration in soil-mg/kg			-
Arsenic	3.5E-04	2.7E-06[f]	130
PAH[d]	1.1E-04	1.7E-07[f]	647
TCDD	1.2E-09	2.16E-10[e]	4.6
Soil Exp. mg/day	100	100	1
Receptor (child) weight-kg	17	17	1
Exposure duration			
days/year	182	18	10
years	5	1	5
Exaggeration in assumptions			
Arsenic 6,500			
PAH 32,350			
TCDD 230			
Risk			
Arsenic	1.1E-03	1.7E-07	
PAH	1.9E-04	5.8E-09	
TCDD	3.9E-05	1.7E-07	
Total	1.3E-03	3.5E-07	

a-Assumptions as presented in Exhibit 1, RI/FS.
b-Assumptions which more reasonably meet the EPA requirement for "probable worse case" exposure assessment.
c-Ratio of RI/FS assumptions and the more reasonable probable worst case assumptions.
d-Sum of the carcinogenic PAH used in the assessment presented in the RI/FS.
e-Average for TCDD calculated using detection limit where non-detect were reported. (NUS Corporation report dated March 20, 1986)
f-Mean of concentrations used to estimate inhalation exposure in the RI/FS.

RATIONALE FOR MORE PROBABLE ASSUMPTIONS

CHEMICAL CONCENTRATION--The RI/FS uses the average concentration for evaluation of the risk from inhalation of contaminated soil but uses the highest concentration reported when evaluating the risk from ingestion of soil. The average concentration is the logical and the technically reasonable concentration to represent the conditions on the surface of the school yard. As was discussed above in relation to the impacts of TCDD in soil, the average concentration present in an area best depicts the chemical environment unless there are unusual hot spots involving a significant percent of the area. The school yard data does not show hot spots which would require special consideration.

The RI/FS does not mention the matrix effect or effect of the absorption of the chemical to the soil particles which hinders absorption and decreases the effective concentration of chemical in the soil. For inhalation exposure it is also important to realize that all the dust over an undisturbed site will not originate from the site itself but will be carried there from other areas. The concentration of dust from the Site will decrease as the distance from the site increases. These factors would all decrease the exposures estimated in the RI/FS.

SOIL EXPOSURE--The RI/FS generally uses a reasonable exposure level for soil ingested by individuals who are five years of age or older (100 mg/day).

The dust level reported in air in the Niagara area is reasonable level to apply to general on-Site exposure to dust by inhalation, but the use of the "nuisance dust" limits of ACIGH for dust levels during construction for all the working days in the year is a gross exaggeration of the probable dust level encountered at any construction sites, even under the dustiest conditions. A dust level 20 times the ambient level (0.0525) is suggested as a more reasonable worst case estimate for a construction site.

RECEPTORS--The receptors evaluated by the RI/FS appear to be the receptors that would have the greater potential for exposure.

EXPOSURE DURATION--All day, every day, for 70 years is an unreasonable exposure scenario for inhalation dust with the site undisturbed. It assumes that an individual will live out their life on the school yard. Exposure for eight hours per day, and 25% of the days would be a more appropriate worse case estimate.

For the exposure of a child, the five years is not unrealistic since a young child living near the school would be expected to play on the yard during school period and in the summer time while attending the school, but the number of days per year this would involve is overestimated when winter, inclement weather, and the days a child would play at some other location are taken into account. Playing at the school yard 25% of the days would still be a conservative estimate of exposure time.

For the exposure duration on the disturbed site, the number of days that the worker is exposed to excessively dusty conditions is overstated. This would not occur every work day and for the whole year. Exposure to dusty conditions for one day out of four days during the one year construction project still provides a worse case estimate.

The child's exposure is overstated to an even greater extent. Since the area is now a construction area the child would not be playing at a construction site as much as they would play in the school yard. Also, the construction would alter the use of the site and would presumably cover the site with a structure, parking lots, walk ways, lawns, etc. This would then eliminate further exposure to the soil contaminants and the exposure duration would be limited to one year.

REFERENCES:

(1) Handbook an the Toxicology of Metals, Lars Freiberg et al: Editors. Elsevier/North-Holland Biomedical Press, Amsterdam -- New York -- Oxford, 1979.

(2) Hooper, P.R., et al. Mount St. Helen's Ash from the May 1980 Eruption. Science, Vol. 209, September 1980.

(3) Carey A.E., et al. Pesticide Residue Concentrations in Soils of Five United States Cities, 1971 -- Urban Soils Monitoring Program. Pesticides Monitoring Journal, Vol. 13, No. 1, June 1979.

(4) Drinking Water and Health, Vol. 1. National Academy of Science, National Research Council, Washington, D.C. 1977

(5) Walsh, L.M., et al: Occurrence and Distribution of Arsenic in Soils and Plants. Environ. Health Perspecat. 19, 67-71, 1977.

(6) Schroeder, Henry A., et al: Abnormal Trace Metals in Man: Arsenic. J. Chron. Dis., Vol. 19, 1966.

(7) Polynuclear Aromatic Hydrocarbons: Chemistry and Biological Effects. Page 1085. Editors: Alf Bjorseth and Anthony J. Dennis. Battelle Press, Columbus, Ohio. 1980

(8) Polynuclear Aromtic Hydrocarbons: Chemical Analysis and Biological Fate. Page 566. Editors: Marcus Cooke and Anthony J. Dennis. Battelle Press, Columbus, Ohio 1981

(9) Polynuclear Aromatic Hydrocarbons: Chemistry and Biological Effects. Page 1034. Editors: Alf Bjorseth and Anthony J. Dennis. Battelle Press, Columbus, Ohio, 1980

(10) IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Vol. 35, IARC, Lyon, France 1985.

(11) IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Vol. 32, IARC, Lyon, France 1983.

(12) Kimbrough, R.D., et al. Health Implications of 2,3,7,8-Teterachlorodibenzdioxin (TCDD) Contamination of Residential Soil. Journal of Toxicology and Environmental Health, 14:47-93, 1984

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
726 MINNESOTA AVENUE
KANSAS CITY, KANSAS 66101

MAR

Dioxin Sites Cleanup Activities
Weekly Update

March 11, 1988

The Environmental Protection Agency will continue to receive public comment on its Proposed Plan for the Final Management of Dioxin-Contaminated Soil and Final Disposition of Structures and Debris at Times Reach until March 18, 1988.

The proposed plan reviews alternatives to manage dioxin contaminated soils at the Times Reach and Minker/Stout/Romaine Creek sites and identifies the Agency's preferred alternative. The alternatives reviewed include placing a cap on all contaminated soil in the Times Beach area and putting topsoil over the contamination, placing the contaminated soil into concrete storage facilities on the site, onsite the thermal treatment of contaminated soil at the Times Beach Site only, and onsite thermal treatment of the contaminated soil from the Times Beach Site along with other designated Missouri dioxin sites.

The Agency's preferred alternative is onsite thermal treatment of all contaminated soil from the Times Beach site along with other designated Missouri dioxin sites. This preferred alternative also plans for excavation of all dioxin-contaminated soil above 20 parts per billion (ppb) and placing 12 inches of topsoil and vegetation over any areas with levels between one and 20 parts per billion.

Written comments concerning the proposed plan should be addressed to: Rowena Michaels, Director, Office of Public Affairs, U.S. Environmental Protection Agency, 726 Minnesota Avenue, Kansas City. Kansas 66101.

The proposed plan, feasibility studies for Times Beach and the Minker/ Stout/Romaine Creek Site and the administrative records which document our activities at eastern Missouri dioxin sites are available for public review at the Times Beach information center. The center is located at 97 North Outer Road at Lewis Road in front of the former Gallery West Restaurant. Our phone number is (314) 938-6869. The hours of the center are 9 a.m. to 6 p.m. Monday through Friday and 9 a.m. until noon Saturday.

Jeff Young

Jeff Young
Information Center Coordinator

July 20, 1988

93rd Street School, Niagara Falls

Response to OCC (T. Truitt) May 24, 1988 Letter

Letter

1. p.1, ¶2

The construction fill examples refer to the use of fly ash in solidified matrices such as concrete. This is not analogous to soils at the site that are mixed with flyash and other chemical wastes.

2. p.2, ¶2

The letter seems to imply that the PAHs present at this site are due to the presence of asphalt and possible spilled motor oil. This is unlikely. Asphalt is not likely to leach extensive amounts of PAH into the soil and the volume of spilled motor oil, if any, is not likely to account for the total mass of observed PAH.

3. p.2, ¶3

It is not true that the presence of TCDD at this site has not been confirmed. Two prior studies at the site observed TCDD in shallow and deep soils. The observed non-detects for TCDD in the most recent Remedial Investigation do not negate the prior observations for two reasons: 1) sampling was designed so as not to repeat prior locations; and 2) samples were depth-composites which could lead to clean depth subsamples diluting contaminated subsamples resulting in a composite non-detection.

Comments Regarding "Background" Concentrations

4. p.1, ¶2 (Selection of Indicator Chemicals)

The indicator chemicals were selected within the guidelines put forth in the Superfund Public Health Evaluation Manual (EPA, 1986). Because a) many of the chemicals analyzed for at the site were not detected and b) an inadequate database existed for some of the chemicals, professional judgment was exercised in selecting the indicators. Using toxicity and quantity as criteria, the list was narrowed to 10 contaminants that warranted further attention with regard to increased risk at the Site.

5. pp. 2 - 5 (Arsenic Background)

The choice of appropriate reference concentrations representing "background" is often difficult. Although some of the background examples provided may be relevant, the references to volcanoes and pesticide-applied areas such as orchards are inapplicable and misleading when applied to sites in residential areas or schoolyards. Probably the best representation of background arsenic concentrations for this site are the New York, uncontaminated ranges cited by OCC and LEA in the RI (3 - 12 ppm, Walsh et al., 1977; 7 - 10.6 ppm, RI report) and the mean value of soil samples taken from the Control Area during EPA's 1980 Love Canal study, 9.4 ppm (EPA, 1982, "Environmental Monitoring at Love Canal"). By comparison, geometric mean arsenic levels in soils from various U.S. cities were observed to be (Carey, Wiersma, and Tai, 1970):

- Augusta, ME 4.1 ppm
- Philadelphia, PA 8.5
- Honolulu, HA 2.1
- Portland, OR 4.5
- Mobile, AL 0.8

Considering that the average concentration in the surface soils at this site (8.4 ppm) is within this range, it is reasonable to suspect that the average over all soil depths (17 ppm) and the maximum concentration (350 ppm) reflect contributions from unnatural sources.*

*It should also be noted that OCC mistakenly interpreted the <u>air</u> concentrations based on soil concentrations at the site as the <u>soil</u> concentrations themselves (e.g., 0.43 and 2.7 ppm arsenic for surface soils and all depths, respectively). In actuality, these average concentrations are 8.4 and 17 ppm.

Mr. Hopkins April 26, 1988 letter referred to five cases (64th Street - South & North, National Fuel Gas, 59th Street, and Niagara Falls Business Forms Site) that the NYSDOH and ATSDR had concluded that PAH levels were typical of urban areas and no further actions were justified based on the health risks associated with the PAH levels. The Department concurs with ATSDR that there is no imminent health threat at those sites. However, the ATSDR preliminary health assessments for each of the above 5 cases highlight that "very little toxicological information is available on low level exposure to PAH's." This is also the case for the 93rd St. School area. The Department believes it is appropriate to be conservative in evaluating the potential long term impacts to the public that may utilize the 93rd St. School area. Such an evaluation leads to the conclusion that the Department's recommendation of limited excavation and subsequent covering of the area, especially the infield of the baseball diamond, with clean soil is a prudent public health approach to minimize potential exposure of the public to these soils.

Sincerely,

Nancy K. Kim

Nancy K. Kim
Division of Environmental Health Assessment

jlh/81620475

cc: Mr. Tramontano
Mr. Wakeman
Mr. Schick

STATE OF NEW YORK
DEPARTMENT OF HEALTH
Corning Tower The Governor Nelson A. Rockefeller Empire State Plaza Albany, New York 1223.

David Axelrod M D
Commissioner

March 2, 1988

Mr. Robert Schick
NYS Dept. of Environmental Conservation
50 Wolf Rd.
Room 222
Albany, NY 12233

RE: Remedial Investigation/Feasibility Study

Dear Mr. Schick:

The New York State Department of Health has reviewed the Remedial investigation/Feasibility Study for the 93rd Street School Site and has evaluated the soil data for the first two soil horizons (0-1' and 1-2' depths). Exposure to contaminated soil by the public utilizing the playground area is likely to occur in the top horizon (0-1') and could occur in the 1-2' soil horizon should children dig excessively.

The data was presented in 3 major groupings consisting of inorganics (metals), volatiles and Base/Neutral/Acid (B/N/A) extractable organics. Metal levels present in the first two soil horizons were found to be generally comparable to "background" metal levels found in the Eastern United States and the Niagara Falls area. The attachment presents the average metal levels found at 93rd Street School with "background" metal levels from the above referenced areas. Information regarding the references from which these background levels were obtained is provided in the attachment.

Analytical results for the volatile compounds indicate the presence of these compounds at low levels. Of those volatiles detected, two, methylene chloride and acetone, are common laboratory contaminants. Furthermore, many of the volatiles detected were also present in the blank samples. In any event, the volatile concentrations present do not on their own require a remedy to eliminate potential exposure to the public.

The B/N/A data shows the presence of polyaromatic hydrocarbons (PAH’s) which are associated with petroleum products or combustion sources. The levels range from one to almost two orders of magnitude greater than those found in areas not directly impacted by disposal of fill materials or soil (see attachment). The areas of highest total PAH concentrations are IP-9 (1-2'); IP-4 (0-1'); IP-3 (0-1'); and 2P-122 (0-.5') with concentrations ranging from 9.9 to 76.6 ppm.

Overall, the compounds detected and their concentrations do not in the opinion of DOH necessitate the construction of a RECRA cap to protect the public from exposure to the surface soils. Since the area as once used has a schoolyard/playground area and may once again be used as such, it is appropriate to eliminate or reduce the potential for contact by the public. The areas cited above with elevated total PAH levels should be excavated to a depth of at least 2 1/2 feet and the soils appropriately disposed or treated. The entire area should be covered using appropriate methods and with as little change in the present elevation as possible.

DOH concurs with the recommendation for a groundwater monitoring program and the proposed handling of dioxin contaminated soils.

Should you have any questions, please call me at 458-6309.

Sincerely,

Allison C. Wakeman

Allison C. Wakeman, P.E.
Chief, Niagara County Section
Bureau of Environmental Exposure
Investigation

jlh

cc: Dr. Stasiuk
Dr. Kim
Mr. Tramontano
Ms. Sviatyla/Mr. VanValkenburg
Mr. Willson
Mr. Hopkins

INORGANICS (METALS)

Metal (mg/kg)	Ranges for Metal Concentrations: 93rd St. School (0-1' depth)	93rd St. School (1-2' depth)	Average Background Levels Eastern United States[3]	Average Background Levels Niagara Falls, NY[4]
Antimony (Sb) (average)	21-92[1] (19.6)	52-76[2] (29.6)	0.76	-
Arsenic (As) (average)	1.8-42[5] (8.4)	2.7-96 (21.7)	7.40	13.31
Cadmium (Cd) (average)	1.3-6.8 (1.8)	1.4-6.7 (6.2)	-	6.60
Cobalt (Co) (average)	9.9-17 (12.7)	11-17 (13.1)	9.2	-
Lead (Pb) (average)	9.3-343 (54.2)	7.4-177 (41.9)	17	137
Mercury (Hg) (average)	0.12-7.60 (0.40)	.11-23 (1.1)	0.12	1.45

(1) Only 4 positive values of 50 samples were above detection levels. The detection level was generally 12 mg/kg.

(2) Only 4 results for 32 samples were above detection levels. The detection level was generally 12 mg/kg.

(3) Shacklette and Boernger, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984.

(4) Average background levels determined from approximately 20 data sets of surface soil sample results compiled by the Niagara County Health Department, Michael Hopkins, 1987.

(5) Average of all analytical results regardless of QA/QC notes such as spike or duplicate analysis were not within control limits.

NOTE: For all non-detects, the detection limit was used.

93rd Street School
Soil Sample Results
Highest Total PAH Levels[1]

Location	IP-9	IP-3	2P-122	IP-4	2P-115	2P-115	IP-2	IP-2	2P-121	2P-143
Depth	(1-2')	(0-1)	(0-.5')	(0-1')	(0.5-2.5')	(0-0.5')	(0-1')	(1-2')	(0-0.5')	(0-0.5')
Total PAH's mg/kg	76.6	12.6	11.5	9.9	5.6	5.3	4.6	4.2	3.9	3.0

Background levels[2] - virgin soil (covered with grass) - 0.56 mg/kg
- cultivated soil - 0.81 mg/kg
(samples were collected at 15 cm depth)

1. at 50 other sample locations in the top two soil horizons the range was 0.032 to 2.9 mg/kg for total PAH's

2. Wang, D.T. and 0. Meresz, 1982, Occurrence and potential uptake of Polynuclear aromatic hydrocarbons of highway traffic origin by proximally grown food crops. In: Polynuclear Aromatic Hydrocarbons: Physical and Biological Chemistry, Cooke M., A.J. Dennis and G.L. Fisher, eds. Columbus: Battelle Press.

July 20, 1988

93rd Street School, Niagara Falls,

Responses to the Niagara County Health Department Comments

on the RI/FS

1. p. 3, Comment #4.

The County’s approach to determining the acceptability of the site’s soils is a comparison to local "background" concentrations. While it is reasonable to give consideration to background levels, one must distinguish between ambient or "natural" background and anthropogenic background levels. Favorable comparisons to the latter are not in themselves justification for no remedial action. Judging by the PAH examples given (more details are provided below) it appears that the County has relied primarily on data from areas influenced by industrial activities.

Metals. Insufficient information was provided in order to respond meaningfully to this comment. The County did not describe its method of statistical analysis, e.g., the confidence level used, or its data sources, so it is not possible to comment on its conclusions.

PAH. The County inappropriately compared the 93rd Street School site with industrial sites. Therefore, its conclusion that the observed PAH levels at the 93rd Street School are not above background levels is questionable. Study of Niagara Falls Control Areas for the Love Canal monitoring program resulted in no detectable observations of PAHs (see response No. 6 to OCC comments). These data are probably the most appropriate comparison data. Also, the examples provided by the County are mostly of contaminated areas, not of relatively undisturbed areas. For example, three of the five examples are former dumps and the other two are industrial sites; hence high observed PAH levels are not surprising. The County's examples are therefore not appropriate comparisons of contaminant levels. In addition, the cited ATSDR conclusions of insignificant risks at these five sites specifically assume different exposure scenarios than envisioned for the 93rd Street School site. For example, most exposures in these comparison sites were assumed to be limited to infrequent adult exposures in industrial settings.

<u>2. p. 5, Comment #6</u>.

The County's proposal for an incremental risk assessment, combined with its prior comments about Niagara Falls background levels, implies that risks due to residual anthropogenic contamination are acceptable. If a site poses unacceptable risks and it is possible to mitigate such risks, a remedy may still be appropriate for that site.

Response to Occidental Chemical Corporation’s Comments

The second part of OCC's arsenic comment regarding dietary intake of arsenic appears to be simply an attempt at rationalization. If soil ingestion from this site poses a health concern, the fact there may be comparable or higher exposures to arsenic by dietary routes means that such exposures also may pose a health concern. It does not mean that the potential health threats at the 93rd Street School are acceptable. More importantly, the arsenic present at the site is a controllable source of risk which can be minimized, thus minimizing the risk to arsenic as a whole.

It should also be noted that OCC's estimates of arsenic intake from food (Schroeder and Balana, 1966) are at the high end of values reported in the literature. In contrast to that paper, which estimated daily arsenic intakes of 400-1000 μg/day, more recent studies have estimated daily intakes of total arsenic of approximately 50 μg/day (US EPA, 1984; JRB, 1984).* Decreases in arsenic levels in food are thought to be due to decreased use of arsenical pesticides since the 1960s. In addition, these studies have noted that much of this intake is from arsenic in seafood, which is typically an organic form of arsenic which is rapidly excreted unchanged. Thus, inorganic arsenic intake is estimated as 8.6 μg/day (JRB, 1984), approximately two orders of magnitude less than the value used by OCC (900 μg/day).

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*US EPA. March 1984. Health Assessment Document for Inorganic Arsenic. Office of Health and Environmental Assessment. EPA-600/883-021F.

JRB Associates. September 27, 1984. Occurrence of Arsenic in Drinking Water, Food, and Air. Prepared for US EPA.

In addition, OCC’s comparison of intake via soil at the 93rd Street School site with daily food intake is skewed by use of incorrect average soil concentrations (see Comments #5, 9, and 11). Using the lower food intake rates (8.6 μg arsenic/day), ingestion of the most highly contaminated soils (350 ppm) would result in arsenic intake that was 4.1 times the intake rate from food.

6. pp 4 - 6 (PAH Background)

As with arsenic, OCC presents some background examples which are not relevant representations of a schoolyard in a residential area. Asphalt, used motor oil, and vegetables are not comparable matrices to soils at the 93rd Street School. Probably the most representative background levels are the observations from the Niagara Falls Control Areas in the 1980 EPA Love Canal study cited above. In that study, the Control Area samples showed no detectible concentrations of the PAHs being considered at the 93rd Street School. By comparison several studies have found levels of total PAHs (up to 17 individual PAHs) in the following soils:

- 1.1 ppm — Canadian farm soil near a highway (Edwards, 1983. J. Envi. Qual. 12(4):427-441.

- 0.01 - 10 ppm 90% of urban soils examined (U.S. EPA, 1982. “An exposure assessment for Benzo(a)pyrene and other polycyclic aromatic hydrocarbons")

- 0.006 ppm Swiss alpine soils (Bluner et al.,1977. Envi. Sci. Technol. 11(12):1082-1084.

Finally, lake sediments might be a reasonable reference for particulate PAH levels resulting from surface runoff and atmospheric deposition. The Adirondack lake sediments example provided by OCC indicates concentration from 1.2 to 5.6 ppm for the 6 PAHs. Based on these above examples it remains unclear whether or not average soil levels found at the 93rd Street School (1.1 to 2.9 ppm, surface and full depth averages, respectively) fall into "background" classification.

7. pp 6 - 7 (TCDD Background)

EPA’s Dioxin Strategy (EPA report No. EPA/530 -SW-87-025) Tier 7 samples were intended to represent "ambient" concentrations of 2,3,7,8-TCDD. U.S. urban soils where TCDD was detected (7 of 15 cities; 17 of 221 samples) ranged in values from 0.4 to 11.2 ppt. In contrast, 93rd Street School soils where TCDD was detected (4 out of $ 50 samples) had values ranging froin 110 to 2,300 ppt.

Therefore, it is reasonable to conclude that the dioxin found at the site is not attributable solely to background.

Comments Regarding Risk Assessment Assumptions

In general, OCC’s alterations of the RI/FS risk assessment assumptions are arbitrary and unsupported. Because substantial uncertainties exist regarding the true magnitude of exposure to site contaminants, assumptions are developed in the RI/FS which are conservative (i.e., more likely to overestimate than underestimate risk), yet which are possible and provide an upper bound on estimates of exposure and risk. The following are responses to specific risk assessment elements where disagreement exists between the RI/FS and OCC.

8. pp 9 and 13 - 15 (Assumptions for Inhalation/Undisturbed Site)

a) Soil Concentrations - OCC suggests using 20% of the concentrations used in the RI. Although no justification is provided for this assumption, it presumably accounts for windblown dilution by dust from offsite areas. A realistic worst case should be based on 100% of the average surface soil concentration, as was used in the RI.

b) Airborne Particulates - The value used in the RI, 0.0525 mg/m^3, is based on ambient Niagara Falls measurements and is thus justified. OCC used 20% or this value, perhaps again to account for dilution with clean particulates. This would result in double counting of this effect, thus making it even more difficult to justify. As with the soil concentration assumption, no justification is provided for this assumption.

c) Exposure Duration - A 24 hour duration does not assume a lifetime in the school yard. Rather, it includes exposures in a home adjacent to the site.

While assumption of exposure 365 days per year is very conservative, this level is frequently used in risk assessment and provides an upper bound on exposure and risk. Moreover, selection of some lower number of days of exposure (which would reduce the risk proportionally) would be arbitrary. OCC provides no justification for its statement that an eight-hour exposure per day for 25% of the time is an appropriate worst-case estimate.

9. pp, 10 and 13 -15 (Assumptions for Ingestion/Undisturbed Site)

a) Soil Concentration - OCC suggests that the ingestion scenario should have used average soil concentrations. Initially, it should be noted that OCC's calculations incorrectly used the airborne contaminant concentration (2nd line of Table 3 in the RI risk assessment) to represent average surface soil concentrations. This error results in an underestimate of the average soil concentration by a factor of 20 (i.e. 1/0.0525 mg/m^3). Moreover, even if the actual average soil concentrations are used,* the total risk estimate for arsenic, TCDD, and PAH contamination at the site is 2.6 x 10^{-5} (for surface soil in the fill area).

b) Exposure Duration - The value of 182 days/yr used in the RI risk assessment is a reasonable value to

*The average surface soil concentrations in the fill area for arsenic, TCDD, and PAHs are 5 ppm, 220 ppt, and 1.5 ppm, respectively use to account for frozen soil periods (wet soils may still be ingested); OCC's use of 91 days/yr is not conservative enough. Moreover, soil wetness could actually <u>increase</u> the amount of exposure to soil contaminants because more soil could stick to the hands and accidentally be ingested.

<u>10. pp 11 and 13 - 15 (Assumptions for Inhalation/Disturbed Site)</u>

a) Soil Concentrations - OCC provides no justification for the soil concentration it suggests, i.e., one-half the values used in the RI. The values used in the RI were based on the full-depth average of the soils to represent soils excavated from depth and either left in a pile or regraded along the surface.

b) Air Particulates (Soil Exposure) - Although the RI describes using 10 mg/m^3 as an air particulate concentration, a lower level was actually used in the calculations and the text was never corrected. OCC's suggestion of using 20 times, Niagara Falls background, i.e., 1 mg/m^3, is also a reasonable assumption, although a less conservative value, 0.15 mg/m^3, was used in the RI/FS.

c) Exposure Duration - The worker inhalation scenario in the RI/FS envisions exposure for one year, five work days per week. This year, however, need not be limited to a single calendar year. Instead, it encompasses a construction project which involves 52 work weeks of exposure, but which could span more than one year, thus allowing for no exposure during certain portions of the calendar year. OCC provides no justification for its assumption of exposure of only one day of every four; this assumption is not conservative enough.

<u>11. pp 12 and 13 - 15 (Assumptions for Ingestion/Disturbed Site</u>

a) Soil Concentrations - As in the undisturbed site ingestion scenario, OCC again incorrectly used the airborne contaminant concentrations ("C_a” in Table 3 of the RI risk assessment) to represent average soil concentrations. Although these values were derived from the full-depth averages, they were then adjusted by air particulate concentrations; hence they are not actual soil concentrations. While maximum concentrations were used in the ingestion scenarios in the RI/FS, even if the actual average soil concentrations are used, the total risk estimate for arsenic, TCDD, and PAH contamination at the site is 7.1×10^{-5} (for soil at all depths in the fill area). This risk value corresponds to average soil concentrations in the fill area of 18 ppm, 220 ppt, and 3 ppm for arsenic, TCDD, and PAHs, respectively, and uses an air particulate level of 0.15 mg/m^3 (2 ½ times background) as used by the authors of the RI/FS risk assessment.

b) Exposure Duration - The RI risk assessment used a 5 year child exposure because it was assumed that, although “construction” may last for only a year, a soil pile could remain or excavated soils could be redistributed by surface grading. The 182 day/yr exposure is a reasonable, conservative estimate allowing for no exposures during frozen soil periods.

SECTION IV

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

Memorandum

Date May 16, 1988

From Health Scientist
Emergency Response Branch

Subject Health Consultation: 93rd Street School (SI-87-006B) Niagara Falls, New York

To Mr. William Q. Nelson
Public Health Advisor
EPA Region II
Through: Chief, Emergency Response Branch, OHA, ATSDR

STATEMENT OF PROBLEM

Filling of a drainage swale occurred before construction of the school in 1950. The fill material (primarily fly ash) was from the Love Canal Site. This material reportedly had 0.5 to 3 feet of cover placed on it. Several investigations of the 93rd Street School site have occurred because of concern that chemicals found at the Love Canal might be in this fill material. These studies were to determine if there are chemicals present at concentrations which would potentially cause a threat to public health.

The Environmental Protection Agency (EPA) has requested the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate the data available for the soil and water from the site and comment on the potential threat to human health posed by the presence of:

-- Arsenic,
-- Volatile Organic Chemicals (VOC’s), and
-- Polynuclear Aromatic Hydrocarbons (PAH’s).

DOCUMENTS REVIEWED

1. "First Round Data Analysis for 93rd Street School Site, City Of Niagara Falls. Niagara, New York," Loureiro Engineering Associates, marked "preliminary for review purposes only." Dated May 26, 1987.

2. "Remedial Investigation Summary, Remedial Investigation/Feasibility Study Report for the 93rd Street School Site City of Niagara Falls Niagara, New York," Volume I, Loureiro Engineering Associates, December 4, 1987.

3. Appendices - "Remedial Investigation Summary, Remedial Investigation/Feasibility Study Report for the 93rd Street School Site City of Niagara Falls Niagara, Now York,” Volume I, Loureiro Engineering Associates, December 4, 1987.

4. “Feasibility Study, Remedial Investigation Summary, Remedial Investigation/Feasibility Study Report for the 93rd Street School Site City of Niagara Falls Niagara, New York," Volume II, Loureiro Engineering Associates, December 4, 1987.

5. Memorandum, Robert W. Schick, NYDEC to Joel Singerman, EPA Region II, December 9, 1987.

6. Memorandum, George Pavlou, EPA Region II to William Q. Nelson, ATSDR, December 23, 1987.

7. Memorandum, George Pavlou, EPA Region II to William Q. Nelson, ATSDR, July 15, 1987.

8. Request for Assistance, William Q. Nelson, ATSDR to Chief, Office of Health Assessment, ATSDR, July 31, 1987.

CONTAMINANTS AND PATHWAYS

The contaminants of interest are metals, PAH's, and VOC’s. The primary routes of exposure are those of: direct contact with, and either inhalation or ingestion of, the soil containing these contaminants. There are high concentrations of chemicals reported at several locations an the 93rd Street School Site. However, most of these were from subsurface samples. Thus, it does not appear that any of these exposure routes are of concern under the existing conditions.

There is a shallow parched aquifer within the fill. However, there is no one using this water, and the reported contamination is low. With the concentration for most organic compounds reported not being significantly different from the concentration reported in the blank samples. The reported concentration of acetone In well 7140 is 1100 ug/l. However, since this water is not being used for either human consumption or contact there is no apparent opportunity for exposure.

The release of this acetone contaminated groundwater to Bergholtz creek should have little effect an the aquatic organisms in the creek. Since this compound is not significantly bio-accumulated, food chain exposure is not a concern. The organic chemical results for the two on-sits surface water samples show concentrations similar to the blanks. Thus, this does not appear to represent a significant exposure pathway. The results, for inorganic chemicals in water samples from this site are not significant. While elevated antimony concentrations are in both soil and water samples, these values do not pose a threat to human health at this site. Thus, there is no apparent route of exposure that exists between the chemicals and the people in the community.

DISCUSSION

The reported results from all the most resent samples analyzed for dioxin were "non-detect." These samples were composite samples of subsurface soil collected from the fill material. Although, some sample locations there was an aliquot from the surface to 1 foot core included in the sample. However, in most the composite did not include this uppermost portion of soil. In order to identify the worst contamination on the site the investigators use a biased sampling plan. This plan concentrated on sampling the fill material. Thus, there is no apparent evidence that the material used as fill material at the 93rd Street School contains dioxin.

Earlier sampling at the 93rd Street School sits reportedly identified four locations with positive dioxin findings. These ranged from 0.11 to 2.3 ug/kg. The highest result vat in a sample 4 to 6 feet below the surface. The other three positive findings were for surface samples collected during September 1985 by NUS Corporation. ATSDR does not have the maximum dioxin value for surface samples in the data reviewed. However, it was less than 2.3 ug/kg which shows there is a rather low level of dioxin in one-site surface soils.

For any environmental chemical the opportunity for exposure depends upon both concentration and areal distribution in the soils as well as human access. The dioxin data shows the combination of conditions for this site does not provide a significant opportunity for excessive exposure. Based on the data available, the small amount cf dioxin on the site would not prevent conversion of the area to residential use.

Region II did not specifically request an evaluation regarding the dioxin results. However, we included it in order to demonstrate the components of exposure to chemicals in soil. In the documents reviewed there was no consideration of these concepts. Site evaluation used only the maximum concentration of each chemical without consideration for where this occurred or whether the data showed wide spread distribution.

While Region II requested ATSDR's opinion specifically of the health threat associated with arsenic at the site, we have evaluated all the metals data reported from the site. Table 1 presents the comparison of the maximum concentrations reported for the metals with surface soil data reported in the literature. Several of the site maximum reported values exceed the typical medium literature values which might show the influence of man's activity. There are a few metals whose maximum reported concentrations are more than the maximum reported literature values. Some of these concentrations could be of health concern under certain site specific situations.

Table 2 presents the results for those metals whose maximum soil concentrations might be of concern under certain site specific conditions. Evaluation of possible human exposure must consider: the opportunity for contact, the frequency for contact, and the concentration of the chemical. Table 2 shows that the concentration of the next highest value drops by a factor of two or more, one (zinc) by a factor of 100. Using the next to maximum concentration, the value for half of the metals (antimony, arsenic, thallium, and zinc) in Table 2 drop below the maximum reported literature values. This shows that, while there may be hot spots of contamination, there is not apparent evidence of widespread, excessive contamination of the site by these metals.

When considering the other metals which appear to have a wider distribution, further evaluation of the data is necessary. Table 2 also presents the median value calculated for all the samples reported in Appendix H (item 4). These calculations used all the reported values, although there were many values which had qualifiers. Some showing either their limited reliability or that the value was the contract detection limit. Comparison of the medium values of the four remaining metals in Table 2 with the surface soil literature values shows that only those for magnesium and molybdenum remain above the maximum reported literature values. The medium value for cadmium (3.5 mg/kg) and mercury (0.013 mg/kg) fall well below the literature maximum value of 194 mg/kg (cadmium) and 4.6 mg/kg (mercury).

Because there were no surface soil sample, we have considered the 0 to 1 foot sample to represent the surface soil. Considering the data from this soil, which someone might actually contact, the median concentration for most of the metals decreases further. Only the medium concentrations for both magnesium and molybdenum are above the maximum reported literature value both in all samples and in the 0 to 1 foot samples.

The National Academy of Sciences (NAS) ("The Contribution of Drinking Water to Mineral Nutrition in Humans," NAS report for EPA, p 171, 1979) estimated that an adequate and safe daily intake of molybdenum for adult humans is 0.15 to 0.5 mg/d.

A child ingesting 0.5 g/d of soil from this site for the 0.4 of the year that the soil is accessible (climatological limitations) would ingest 0.015 mg/d. This is one tenth the NAS estimated safe level. Thus, molybdenum in the surface soil does not present a threat to human health.

The same NAS report states that the average daily intake for magnesium for a child between 1 and 3 years old is 150 mg. Studies show that this age group ingests the most soil. Using the values for daily soil ingestion previously presented, the average daily magnesium ingestion from the site for a child would be 1.6 mg, about 0.01 of the average daily Intake. Thus, although the highest magnesium concentration in the soil is above the maximum reported literature surface soil value, there is no apparent threat to human health from ingestion of the soil.

Our earlier evaluation of arsenic demonstrated that the median concentration in the on-site surface soil was less than the typical median value reported in the literature. The maximum value reported for on-site surface to 1 foot soil was 6.8 mg/kg. This value is also less than the typical median value (11 mg/kg) from the literature for surface soils.

A study by the Centers for Disease Control, center for Environmental Health (Binder, S., Forney, D., Kaye, W., and Paschal, D., "Arsenic Exposure in Children Living Near a Former Copper Smelter," Bull. Environ. Contam. Toxicol. 39:114-21, 1987) found that children living in an area where the soil contained an average of about 130 mg/kg of arsenic shaved no elevation in urinary arsenic. However, some of a similar group of children living in an area with average soil arsenic levels of about 700 mg/kg did show elevated urinary arsenic. Thus, at some arsenic level between 130 mg/kg and 700 mg/kg soil ingestion is great enough to demonstrate, in some children, an increased exposure. With the maximum reported arsenic concentration located beneath four feet of soil, it is not likely to cause a threat to human health. It is the opinion of ATSDR that the concentration of arsenic found in the surface soils does not pose a human health threat.

Except for the methylene chloride and chloroform, less than half of the samples analyzed reported any detectable quantity of the VOC’s. Table 3 shows soil guidance values derived by assuming that a 10 kg child would ingest 0.5 g/d of soil contaminated with a quantity of the chemical equal to the EPA Office of Drinking Water, Lifetime Health Advisory (LTHA)(March 1987). For VOC’s the LTHA is generally equal 0.2 times the amount of chemical considered to be safe for lifetime daily ingestion. This value usually comes from either chronic or sub-chronic animal data. Dividing either a no observed adverse effect level (NOAEL) or a lowest observed adverse effect level (LOAEL) value by a safety factor produces an LTHA.

Table 3 presents these guidance values for site related VOC’s. Comparing the reported values with the guidance values shows that the concentrations for 6 of the VOC’s are of no health concern.

Only two samples reported the presence of 1,1,2,2-tetrachloroethane. One at the surface (1,600 ug/kg) and the other (520 ug/kg) under 4 foot of soil. This chemical has produced liver tumors in one species of animal(mouse); however, tests in other species have produced equivocal results. Thus, it is not a proven animal carcinogen. The National Institute for Occupational Safety and Health (NIOSH recommended maximum work place concentration (10 hour day) is 7 mg/m^3 For a 70 kg adult, this is equivalent to 70 mg per work day. If one assumes a 0.5 absorption factor for the tetrachloroethane from inhaled air, the adult male worker could have an intake of 35 mg/day 4 to 5 days per week or 380 ug/kg/day. If a 10 kg child would ingest soil, based upon the childhood scenario developed previously, from the area with 1,600 ug/kg of soil the tetrachloroethane ingested would be 0.032 ug/kg. This is less than 1/10,000 of the NIOSH recommended maximum industrial exposure. Since this chemical was in only one surface sample, the likelihood for a young child to ingest soil from this location on a daily basis is small. In addition, it is very unlikely that parents would allow an 19 month old child to play frequently 100 yards or more from its residence. The worst case scenario predicts a very low potential exposure with the real likelihood of exposure even lower. Therefore, the reported tetrachloroethane soil contamination does not pose a human health threat from either direct contact or ingestion.

There is no guidance value for Acetone in Table 3. It is chemically similar to, and present on the site at concentrations similar to 2-butanone. The maximum concentration of 2-butanone is below the guidance value and therefore of no health concern. Therefore, the presence of Acetone does not pose a threat to human health by either direct contact or ingestion.

Methylene chloride, the remaining VOC without a guidance value in Table 3, has low toxicity. The NIOSH work place guideline for this compound is equal to 26,600 ug/kg/day. Based on the 10 kg child soil ingestion scenario used for tetrachloroethane, the estimated ingestion. for methylene chloride is 0.15 ug/kg/day. This is about 5.8×10^{-6} times the maximum allowable workplace exposure. The worst case scenario predicts a very low potential exposure with the real likelihood of exposure even lover. Therefore, the reported soil contamination by methylene chloride does not pose a human health threat from either direct contact or ingestion.

Only soil samples greater than 2 feet deep reported low concentrations of p-dichlorobenzene. Based upon the LTHA for p-dichlorobenzene (75 ug/l) a guidance value for soil can be derived equal to 375 mg/kg. The maximum concentration of p-dichlorobanzene found on the site was 830 ug/kg. Therefore, p-dichlorobanzene does not pose a human health threat from either direct contact or ingestion.

Polynuclear Aromatic Hydrocarbons were in less than 35 percent (Table 4) of all the samples analyzed. The maximum reported concentration in the soil samples for several of the specific PAH's, could be of concern, if they represented the average value in residential surface soils. However, the contamination is not uniformly distributed, as shown by more than 65 percent of the samples showing no detectable contamination.

Table 5 presents the maximum reported surface soil results for PAH's at the site. The total of these highest reported surface soil concentrations is less than 25 mg/kg. Because of the distribution of PAH contamination at any one sample location, no single sample achieves this maximum concentration. At any given sample location the opportunity for exposure is less, than 25 mg/kg total PAH. Considering the limited spacial distribution and the low concentration of PAH's in the surface soils the opportunity for exposure is slight. It is ATSDR's opinion that concentrations of total PAR in residential surface soils less than 100 mg/kg do not pose a significant threat to human health by any route of exposure.

The 93rd Street School Site covers about 20 acres. The majority of the surface soils on the site apparently have little contamination. The School's building or parking lot cover about half of the surface area for which soil samples show some contamination. Thus, the exposed portion of the site that may have surface soil contamination covers perhaps 0.5 acre. It is possible to envisage an unvegetated 20 acre area contributing substantial dust to the air during extreme climatological events. However, it is difficult to conceive of this 0.5 acre part of the 93rd Street School Site contributing a significant portion to the air borne particulate for the immediate residential community at any time.

The 1986 annual geometric mean suspended particulate value reported for Buffalo, New York ("National Air Quality and Emissions Trends Report," 1986, EPA-450/4-88-001, February 1988) is 48 ug/m^3. This value (1986) for the 1435 sites in the report was 50 ug/m^3. In comparison to these values, the Remedial Investigation (RI) uses a 10,000 ug/m^3 value to estimate potential long-term exposure to chemicals from site related particulate. Based upon the EPA national air monitoring data this 10,000 ug/m^3 value is excessive for any exposure. This value is nearly 40 times the former National Primary Ambient Air Quality 24-hour Standard for particulate of 260 ug/m^3. Recent revision of this standard addresses the respirable range rather than total particulate. Nevertheless, the 260 ug/m^3 is the appropriate value to use in comparison to the 10,000 ug/m^3 used in the RI. With RI particulate, the health concern would not be for the chemicals within the soil nearly so much as for the particulate matter itself.

CONCLUSIONS AND RECOMMENDATIONS

It is the opinion of ATSDR:

-- That the concentration of arsenic and all other metals found in the surface soils pose no threat to human health by any route of exposure.

-- That the reported soil contamination by VOC's do not pose a human health threat by any route of exposure.

-- That reported concentrations of total PAH's in the surface soils at the 93rd Street School Sites does not pose a threat to human health by any route of exposure.

-- That the presence of molybdenum in the surface soil on the site does not present a threat to human health.

The potential for this site to generate a substantial portion of the total (on a yearly basis) suspended particulate within the local community is apparently rather small. In addition, the reported surface concentration for most of the chemicals found at this site are, on average, low.

The biased sampling reported in the RI has demonstrated little contamination in the surface soils of the 93rd Street School site. However, a more complete sampling of the immediate surface soil (0 to 2 inches) in the area of fill would provide a better data base upon which to evaluate the potential for that area to provide a source for significant exposure for persons using the site.

If it becomes necessary to determine more accurately whether there are surface soils in need of remediation, use the 95 percent confidence sampling procedure developed for EPA Region VII.

Mark A. McClanahan, Ph.D.

TABLE 1. COMPARISON OF 93RD. STREET SCHOOL SITE MAXIMUM SOIL CONCENTRATIONS TO SOIL VALUES REPORTED IN THE LITERATURE FROM UNCONTAMINATED AREAS

ELEMENT	MAXIMUM SITE CONCENTRATION mg/kg (ppm)	CONCENTRATION RANGE IN US SOILS mg/kg (ppm)	TYPICAL MEDIAN mg/kg (ppm)	SOURCE
aluminum	10,700	10,000 - 300,000	71,000	1
antimony	209	0.2 - 150	6	1,2,3 & 4
arsenic	350	0.1 - 194	11	5
barium	565	100 - 3,000	500	1
beryllium	3.4	0.01 - 40	0.3	1
cadmium	133	0.01 - 7	0.5	6
calcium	202,000	< 150 - 500,000	24,000	1 and 7
chromium	516	5 - 3,000	100	6
cobalt	52	0.05 - 65	8	1
copper	44	2 - 250	30	1
iron	86,600	100 - 550,000	40,000	1 and 5
lead	177	< 1 - 888	29	5
magnesium	42,000	400 - 9,000	5,000	1
manganese	3,000	20 - 18,300	1,000	1, 5 & 6
mercury	23	0.01 - 4.6	0.098	5
molybdenum	229	0.1 - 40	2	1 and 6
nickel	47	0.1 - 1,530	50	1 and 5
potassium	3,550	80 - 37,000	14,000	1
selenium	4.1	0.1 - 38	0.4	1 and 6
silver	3.2	0.01 - 8	0.4	5
thallium	1.2	0.1 - 0.8	0.2	1
titanium	825	150 - 25,000	5,000	1
vanadium	59	3 - 500	100	1, 6 & 7
zinc	18,200	1 - 2,000	90	1 and 5

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TABLE 2. COMPARISON OF NEXT HIGHEST REPORTED VALUE, MEDIAN FOR ALL VALUES, AND MEDIAN OF 0 TO 1 FOOT VALUES FOR THE 93RD. STREET SCHOOL SITE SOIL SAMPLES

ELEMENT	MAXIMUM SITE CONCENTRATION mg/kg (ppm)	NEXT HIGHEST CONCENTRATION mg/kg (ppm)	MEDIAN ALL SAMPLES mg/kg (ppm)	MEDIAN 0 TO 1 FOOT mg/kg (ppm)
antimony	209	92	41.2	22.6
arsenic	350	105	5.3	4.5
cadmium	133	11	3.5	2.4
magnesium	42,000	33,900	4,095	7,850
mercury	23	21	0.13	0.14
molybdenum	229	132	70.5	76
thallium	1.2	NO OTHER POSITIVE VALUE	DETECTION LIMIT	1.1 TO 3.7
zinc	18,200	182	84.5	82

TABLE 3. CONCENTRATION OF VOLATILE ORGANIC CHEMICALS FOUND IN SOIL SAMPLES AT THE 93RD. STREET SCHOOL SITE

CHEMICAL	HIGHEST REPORTED ug/kg	NEXT HIGHEST ug/kg	NUMBER OF NONDETECTS	GUIDANCE LTHA (1) ug/kg
methylene chloride	7,700	7,400	13 of 68	no value
acetone	4,500	4,000	35 of 68	no value
1,1-dichloroethene	670	ND	67 of 68	35,000
chloroform	1,100	1,100	26 of 68	500,000
2-butanone	5,300	4,500	38 of 68	850,000
1,1,2,2-tetrachloroethane	1,600	520	66 of 68	no value
toluene	13,000	6,100	41 of 68	12,100,000
ethylbenzene	1,600	1,500	46 of 68	3,400,000
xylenes	2,000	1,800	46 of 68	2,000,000

1 Guidance value obtained by assuming that a child might ingest 0.5 grams of contaminated soil per day for a 0.4 part of the year and the Life Time Health Advisory (LTHA) publish by EPA, Office of Drinking Water, March 1987.

TABLE 4. CONCENTRATION OF ORGANIC CHEMICALS FOUND IN SOIL SAMPLES AT THE 93RD. STREET SCHOOL SITE

CHEMICAL	HIGHEST CONCENTRATION ug/kg	NEXT HIGHEST CONCENTRATION ug/kg	NUMBER OF NONDETECTS
1,4-dichlorobenzene	830	720	64 of 70
naphthalene	1,500	520	57 of 70
2-methylnaphtalene	910	240	60 of 70
acenaphthene	11,000	1,800	64 of 70
dibenzofuran	62,000	9,600	64 of 70
flourene	14,000	2,500	63 of 70
phenenthrene	82,000	14,000	47 of 70
anthracene	22,000	4,300	59 of 70
fluoranthere	45,000	9,400	47 of 70
pyrene	56,000	20,000	46 0f 70
benzo(a)anthracene	26,000	6,500	57 of 70
bis(2-ethylhexyl)phthalate	630	210	21 of 70
chrysene	24,000	5,700	54 of 70
benzo(b)fluoranthene	31,000	3,600	55 of 70
benzo(k)fluoranthene	4,900	4,200	61 of 70
benzo(a)pyrene	19,000	4,300	59 of 70
indeno(1,2,3-cd)pyrene	8,200	2,100	63 of 70
benzo(g,h,i)perylene	2,000	870	65 of 70
alpha BHC	20	13	67 of 70
beta BHC	137	34	64 of 70

TABLE 5. POLYNUCLEAR AROMATIC HYDROCARBON RESULTS FOR 0 TO 1 FOOT SAMPLES FROM 93RD. STREET SCHOOL SITE

CHEMICAL	HIGHEST CONCENTRATION ug/kg	MEAN CONCENTRATION ug/kg	NUMBER OF NONDETECTS
naphthalene	16J	13J	12 of 15
2-methylnaphtalene	-	-	15 of 15
acenaphthene	96J	83J	13 of 70
dibenzofuran	9,600	4,820	13 of 15
flourene	120J	90J	13 of 15
phenanthrene	1,300	515	8 of 15
anthracene	270J	116J	10 of 15
fluoranthere	1,900	536	6 of 15
pyrene	3,000	852	7 of 15
benzo(a)anthracene	1,200	695	11 of 15
chrysene	1,400	635	9 of 15
benzo(b)fluoranthene	1,100	502	10 of 15
benzo(k)fluoranthene	900	707	12 of 15
benzo(a)pyrene	1,000	710	12 of 15
indeno(1,2,3-cd)pyrene	650	487	12 of 15
benzo(g,h,i)perylene	830	765	13 of 15

July 20, 1988

93rd Street School, Niagara Falls

Response to ATSDR Comments (Memo to W.Q. Nelson, 5/16/88)

In general, ATSDR's health consultation is too limited in scope to comprehensively address the health risk issues at the site. Various screens, e.g., comparisons with "background" concentrations, are applied to the site data to eliminate certain substances from further evaluation with no consideration of the inherent toxicity of the eliminated substances or the risks which may be posed by "background" concentrations or simultaneous exposure to multiple chemicals. In addition, health criteria used to evaluate the acceptability of concentrations present at the site are based on noncancer health effects, even for substances for which estimates of carcinogenic potency are available. Finally, ATSDR's evaluation focuses on the undisturbed site and surface soil concentrations, ignoring the potential for site disturbance and subsequent exposure to deeper, more contaminated soils. Specific comments follow.

<u>Comments Regarding ATSDR's Conclusions</u>

<u>1. p. 2,¶l</u> - ATSDR states that maximum concentrations of the compounds of concern were found in subsurface samples and that because of this "it does not appear that any of [the] exposure

routes are of concern under existing conditions." No quantitative justification is provided for this conclusion. Moreover, this conclusion can be challenged by quantitative risk estimates of concern developed using the RI/FS exposure scenarios for the undisturbed site and average surface soil concentrations of arsenic, TCDD, and PAHs (2.6×10^{-5} and 6.1×10^{-6}, for ingestion and inhalation, respectively). ATSDR's view also ignores the possibility of future site disturbance and exposures to more highly contaminated soils.

2. p. 3, ¶l - ATSDR states that "there is no apparent route of exposure that exists between the chemicals and the people in the community." It is ambiguous from the context of this statement whether it is referring only to ground water contaminants or to contaminants in soil as well. Current observations of children playing on the site, as well as other recreational uses, suggest that ingestion and inhalation exposures to soil contaminants are occurring.[1] Other on-site and off-site exposures to soil contaminants may also occur. While ground water exposures appear less likely, exposures could occur via contacts with contaminants transported to Bergholtz Creek.

3. p.3, ¶2 - Based on the non-detect results of the most recent dioxin analyses, ATSDR states that there is "no apparent evidence

[1] A.M. Gabalski (NYSDEC). June 29, 1988. Memorandum to 93rd Street School Site Administrative Record Re: Recreational Use of the 93rd Street Site.

that the...fill ... contains dioxin." ATSDR further states that conversion of the site to residential use should not be impeded by dioxin concentrations detected at the site. However, as acknowledged in ATSDR’s comments, earlier sampling detected dioxin in one subsurface and three surface samples, as well as on the banks of Bergholtz Creek. The subsequent study undertaken during the RI/FS does not negate the observations of the prior study for several reasons. For example, the sampling plan undertaken as part of the RI/FS specifically omitted surface soils in the areas where dioxin had previously been sampled for and found, and instead focused on subsurface samples. In addition, the study used composite samples which could dilute any dioxin present at localized depths. As a result of this sampling plan and the use of composite samples, together with the analytical difficulties in detecting low concentrations of dioxin, the failure to detect dioxin in this round of sampling cannot be interpreted as negating prior observations. A further concern is that because of dioxin’s high carcinogenic potency even extremely low concentrations can pose potentially significant risks.

<u>4. p.3, ¶5</u> - ATSDR incorrectly states that the RI/FS risk assessment did not include exposure considerations and only used maximum contaminant concentrations in developing risk estimates. In fact, many contaminants (e.g., volatile organics in soils) were eliminated from detailed risk calculations because they were only present at a few site locations or only at low concentrations. In

addition, maximum concentrations were only used for the ingestion scenarios; average concentrations were used for the inhalation scenarios. Moreover, even if average concentrations are used in the ingestion scenarios, total carcinogenic risks of 2.6×10^{-5} and 7.1×10^{-5} are derived for the undisturbed (surface soils) and disturbed (soils at all depths) site scenarios, respectively (see responses #9 and #11 to OCC comments).

<u>5. p. 5, ¶4</u> - The Binder et al. study cited by ATSDR in support of its contention that soil arsenic levels at the site do not present a health concern relates soil arsenic concentrations to measures of exposure, not health impact. The health impact of concern following arsenic ingestion is development of skin cancer. Failure to induce elevations in urinary arsenic levels does not necessarily mean that no adverse health impacts will be induced. Using average soil concentrations at the site and the current U.S. EPA cancer potency factor for arsenic ingestion, risk estimates of 1.6×10^{-5} and 5.7×10^{-5} are obtained for the undisturbed and disturbed site scenarios, respectively. ATSDR also has ignored the potential for inhalation of arsenic on windblown dust from the site. Risk estimates for the site for arsenic inhalation are 6.0×10^{-6} and 2.8×10^{-7} for the undisturbed and disturbed site, respectively.

<u>6. p. 7, ¶¶1-2</u> - ATSDR provides no health-based, technical justification either for dismissing the potential health impacts of PAH levels detected at the site or for its statement that

"concentrations of total PAH in residential surface soils less than 100 mg/kg do not pose a significant threat to human health by any route of exposure." The risks posed by total PAHs are highly dependent on the specific composition of the PARs of concern. For example, if the PAHs being considered were 100% benzo(a)pyrene, a soil concentration of 100 mg/kg would yield a cancer risk of 2.4 x 10^{-4} for the ingestion scenario presented for the undisturbed site in the RI/FS. The risk level would be correspondingly less for lower percentages of carcinogenic PAHs. The mean site concentrations indicate a total mean surface soil concentration for the five carcinogenic PAHs considered in the RI/FS of 3.03 mg/kg. Using this concentration, the exposure scenarios developed in the RI/FS for the undisturbed site yield risk estimates of 7.3 x 10^{-6} and 5.4 x 10^{-6} for ingestion and inhalation, respectively. Moreover, while ATSDR is correct that many of the sample analyses for PAHs were non-detects, its comments fail to recognize that almost all of the detected concentration of PAHs are clustered in the "hot spot" area proposed for remediation, increasing the potential exposures and risks posed by that portion of the site.

7. p. 7, ¶¶3-4 - ATSDR incorrectly states that the 10 mg/m^3 air particulate level was used to estimate long-term exposures via air. In fact, long-term exposures to site-related particulates were based on annual average particulate measurements for Niagara Falls (0.0525 mg/m^3). The higher level was only used in initial risk calculations for evaluating air impacts during site disturbance

(e.g., construction). According to the authors of the risk assessment, this value was replaced in later calculations by 2.5 times the background level (0.150 mg/m^3).

8. p.8 - As reflected in the conclusions of ATSDR’s comments, their review focused on the potential health risks posed by contaminants in surface soils and made much of the fact that the highest concentrations at the site were found in deeper soils. Their assessment thus is incomplete as this view ignores potential disturbances at the site (e.g., construction) which could uncover the deeper contaminants and thus increase potential exposures and risks at the site.

Comments Regarding ATSDR’s Methods

9.p. 4, ¶¶1-3 - ATSDR uses "typical background" concentrations as a means of screening the metals data for the site for substances of concern. Their method largely confirms the conclusions of the RI/FS regarding the elements of potential concern. However, as discussed in the responses to OCC’s comments on the RI/FS, background concentrations must be used carefully and must represent appropriate comparisons. For metals in particular, differences in natural levels can vary widely among geographic locations. This can be seen in the data presented by ATSDR which contains ranges for some metals which span up to three orders of magnitude. The most appropriate comparison data, where available, are those from the geographic location of concern. The information provided by ATSDR in its comments is insufficient to allow detailed evaluation of the appropriateness of the data cited.

In addition. ATSDR uses the maximum reported “background” concentration as the benchmark for judging the acceptability of concentrations found at the site.[2] This is particularly fallacious in the second step of ATSDR’s screening process where site concentration medians are compared with maximum literature values. Because natural levels can vary so widely, it is quite possible that average concentration levels at a contaminated site could be less than maximum concentrations reported for a site with naturally elevated concentrations. Average site concentrations should be contrasted with average "background" concentrations from an appropriate comparison location.

10. p. 4, ¶3 - ATSDR’s use of median rather than mean concentrations also tends to minimize the impact of high concentrations in evaluation of site concentrations because

[2]It should also be noted that in addition to the methodological deficiencies in the use of background data discussed in Comment #9, ATSDR appears to have incorrectly applied its own procedure. Specifically, magnesium appears to have been incorrectly identified as a substance of concern (maximum reported literature concentration = 9,000; median site concentration - all samples = 4,095 ppm; 0 to 1 foot = 7,850 ppm). Similarly, the median site concentration of cadmium (3.5 ppm) is stated to be well below the maximum literature value of 194 ppm. In fact, this value (194 ppm) is the maximum literature value listed for arsenic, and the actual literature maximum listed for cadmium (7 ppm) is very close to the site median.

calculation of the median only takes into account the relative rank of the measured concentrations, not their actual value. If the maximum concentrations were viewed as outliers (i.e., anomalous values which are not representative of concentrations at any location on the site), which is apparently ATSDR’s view of the maximum values, the use of median concentrations as representative of site conditions might be appropriate. However, for almost all of the contaminants of concern at this site, the maximum concentrations are less than an order of magnitude higher than the next highest concentration. As a result, use of the mean is more appropriate. This would result in somewhat higher site concentrations, e.g., the median overall site concentration for arsenic is listed as 5.3 ppm in the ATSDR comments while the mean concentration over the entire site and all depths is 17 ppm.

11. pp. 5-6 - ATSDR’s evaluation of the volatile organic chemicals confirms the conclusion of the RI/FS risk assessment that these chemicals do not pose significant potential to induce adverse health impacts. It should be noted, however, that by relying on Life Time Health Advisories from the U.S. EPA office of Drinking Water as benchmarks for health concern, ATSDR is focusing only on noncancer health effects. Similarly, work place guidelines frequently are not based on carcinogenic health impacts. However, several of the chemicals on ATSDR’s VOC list (including two for which no guidance values are given in ATSDR’s table) are suspected carcinogens with cancer potency factors established by EPA (i.e., methylene chloride,